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THE SOCIETY is the growth of over forty years of achievement and leadership. Its members are engineers and technicians skilled in every branch of motion-picture film production and use, in television, and in the many related arts and sciences. Through the Society they are able to contribute effectively to the technical advance of their industry. The Society was founded in 1916 as the Society of Motion Picture Engineers and was renamed in 1950.

Membership in Sustaining, Active, Associate or Student grades is open to any interested person according to his qualifications. Information about membership, technical activities and standards and test films for the industry is available from Society Headquarters. Members residing in countries which participate in UNESCO may use UNESCO coupons in submitting membership payment in the event other means of remitting are not available.

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS

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Journal of the
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Electronic and Motion-Picture Systems in the Space Age

By BARTON KREUZER

During the past five years our Society's interests have been changed beyond prediction by plans to explore and use outer space. The established areas of our industry have continued predicted trends: film and video-tape uses have increased in television broadcasting and closed-circuit television; audio-visual interests have grown and now include 8mm sound film; and our occupation with photographic and electronic systems in research, engineering and documentation has grown. Our role in the Space Age has been to develop weather and communication satellites and systems for lunar and interplanetary space exploration for which we have designed TV and motion-picture systems. These will have an impact on the industry particularly in the education and high-speed photography fields and by way of miniaturization and ruggedization.

FOUR AND A HALF YEARS AGO, as the President of your Society, I had the privilege of delivering a brief report on the state of our art and industry. Noted at that time were some of the prospects for our future. Developing television and film systems for exploration of outer space was not then listed among our prospects. Imaging and related space technology are now established, if not major, interests of this Society. After some reflections upon the interests which have been longer established, the state of our art and our scientific possibilities in the realm of space and imagery will be given a current review.

In a brief span of years, we have seen new technology alter radically the pattern of various activities and open new opportunities for the years to come. It is not so long ago that we were bracing ourselves for the impact of television broadcasting upon the feature film industry. We have found out that both can live and work together in a prosperous environment, meeting the apparently insatiable desire of a growing population for visual entertainment and information both in theaters and at home. Motion-picture theater attendance is now at a level well beyond 2 billion per year, and the film industry has found in television a profitable and apparently reliable long-term outlet for its inventory of feature pictures as well as for films made specially for telecast.

As for television broadcasting, the spectacular explosion of a decade or so has given way to an economically mature industry whose business volume passed the billion-dollar mark in 1958 and is still going up. With more than 530 commercial stations on the air to serve more than 52 million receivers in American homes, the industry in 1961 seems to be headed for a long period of less spectacular but solid growth in an expanding society.

It is far from being a static industry in any sense. New techniques are being brought constantly into programming and equipment. One evidence is the persistent spread of colorcasting. Another, perhaps more dramatic in its immediate impact, is the sharply increased use of video tape. It may yet be too early to estimate the full effect of tape in relation to the use of film in telecasting, but the indications today are that tape recording is destined to replace live programming to a far greater extent than it is likely to replace film.

A clue can be found in the figures for one of the major networks. In 1957, video tape was yet an infant, accounting for perhaps 5% of programming. Live programs in one typical month of that year made up about 75% of the network's schedule, and the remaining 20% was in film. By 1963, this network expects that film will again account for 20%, but that the tape segment will have risen to about 60%, leaving only 20% for live programming.

Feature film and television broadcasting have by now become well established and are somewhat matter-of-fact in our minds. This is all to the good as long as we continue to search for new outlets for the talent and imagination at our disposal. Happily, we do not have to look very far. When we peer beyond the entertainment and broadcast fields, we find that virtually every public and private institution in our society is in the market for new or improved visual communications.

Nontheatrical Film

Today, industry, government and our school systems are investing more than a quarter of a billion dollars annually in producing and distributing films and in buying the equipment with which to show them. More than 300 closed-circuit television systems are in use at our schools, colleges and military bases for classroom instruction and specialized training. These are impressive statistics when we stand them against past years, but they represent only a modest beginning in comparison to the potential.

For example, there are now 1,250,000 classrooms in this country, including public and private schools, colleges and universities. By 1970, there will be an estimated 2 million. At the same time, there is a mushrooming requirement for training or retraining programs within commerce, industry and the military services, to teach increasing numbers of men and women how to operate increasingly complex machines.

Presented on October 2, 1961, at the Society's Convention at Lake Placid, N.Y., by Barton Kreuzer, Radio Corp. of America, Astro-Electronics Div., Princeton, N.J. This was primarily the Society's traditional Get-Together Luncheon address but was supplemented with the projection of slides and a motion picture. A few of the illustrations have been chosen and the text somewhat abridged for this printed presentation.

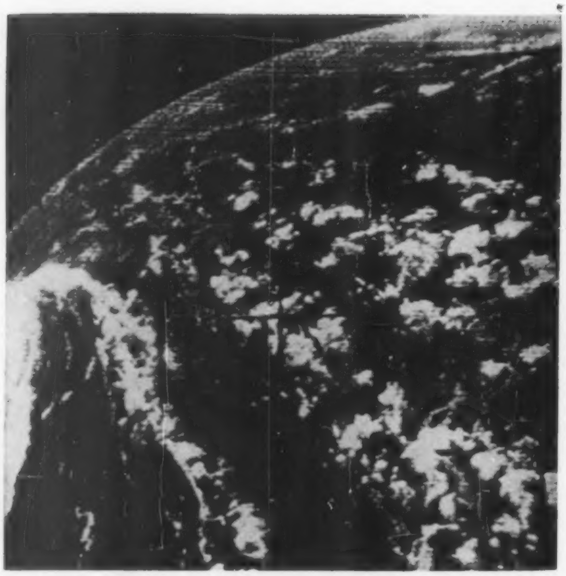


Fig. 1. Photograph of Hurricane Anna, taken by NASA's TIROS III, is first taken of an Atlantic hurricane by a satellite.

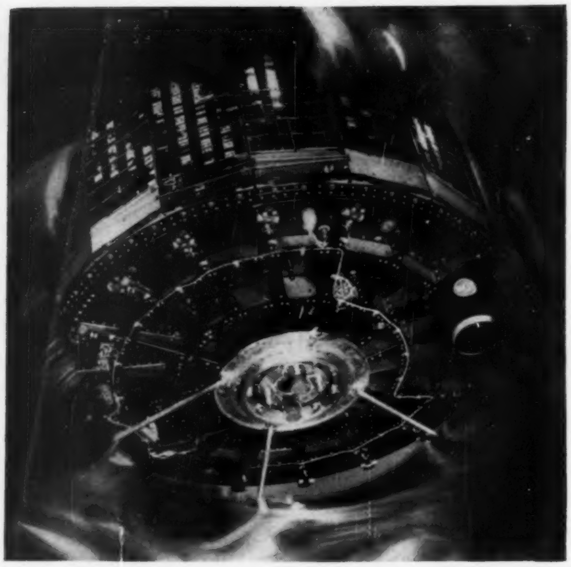


Fig. 2. TIROS weather satellite.

For both motion pictures and television, the opportunities for growth in these educational fields are immense and challenging. One answer to the challenge — but by no means the only one — is the newly emerging 8mm sound film system to which so much attention was devoted at the Society's meeting in Toronto last May. Here is a striking illustration of the extent to which a new technological development in a well-established art can bring about a major revolution by providing a new product and service suited both technically and economically to the requirements of a great market that has remained beyond the reach of more complex or more costly equipment. This is the expectation for the 8mm system, and there seems little reason to doubt the enthusiastic predictions that have been made as to its mass appeal in the educational and consumer fields.

Up to this point this is a hasty review of the more conventional aspects of our activity. The purpose has been to establish a rough perspective in which to consider the remarkable role that motion pictures and television have been assigned in the exploration of space.

Technological Challenge of Space Programs

By comparison with the feature film television broadcasting and educational programs that have been reviewed above, our space activity is unlikely to amount to a major business in the economic sense. It provides us, however, with something far more important: a technological challenge unequalled by any that we have faced in the past. For this reason, the development of visual techniques and equipment for our missile, satellite and space vehicle programs is a prolific breeding ground for the scientific and engineering advances upon which we must depend for continued progress in every other field of interest to us.

Out of today's space programs are coming new imaging techniques, new forms of circuitry and packaging, new optical and electronic means for observing events that occur at high speed or under nearly imperceptible conditions. Along these same paths we can expect to advance to flexible and versatile new techniques and equipment for commercial and educational application tomorrow.

Some of the specific important developments that are coming from space technology today may be discussed, for convenience, in this order: first, some of the imaging systems that journey into space aboard missiles, satellites and space probes; next, some of the new techniques that are being developed to overcome present limitations or to aid us in the swifter analysis of pictures from space; and finally, the ambitious and productive ground-based program in which highly ingenious new photographic techniques and equipment are providing vital help in the basic research, design and vehicle testing that form a key part of our missile and space projects.

Imaging in Space

The job of designing the equipment to function in space raises perhaps the most complicated set of technical problems ever presented to us. The cameras and their associated equipment must operate unattended and without manual adjustment — for weeks or months in the case of satellites or space probes. The systems must survive high vibrational shock in launching, and then must operate in space environment where temperatures may range from 455 below, which is close to absolute zero, up to well beyond the boiling point of water, and where there is not atmospheric pressure or humidity. Frequently, too, these systems must pass through regions of intense radiation. These are the principal enemies, and they are accompanied always by the host of nagging little problems that beset any engineering project. I know of one engineer who faced all of the big worries with equanimity but woke up in a cold sweat a few hours, before the scheduled shoot, from a nightmare in which someone had forgotten to remove the lens caps from the satellite cameras.

Both film and television techniques have proven extremely useful for studying earth from outer space. However, as we contemplate journeys to the moon and beyond, and longer-lived satellites for continuous surveillance of weather and other earth conditions, we shall probably rely most heavily upon television-type systems. This is because of their ability to transmit images immediately and continuously to earth over long periods of time. For this reason, as well as for brevity, I shall deal here only with the television approach, acknowledging that outstanding work has been and will continue to be done on recoverable film techniques and on combined film and electronic scanning methods.

The first long step in space television systems has been the Tiros systems, one of whose recent results is shown as Fig. 1, a photograph of Hurricane Anna viewed from nearly 450 miles in space through one of the two wide-angle television eyes of the third Tiros satellite. One of the most interesting facts about this picture is not visible: it is one of more than 70,000 images trans-

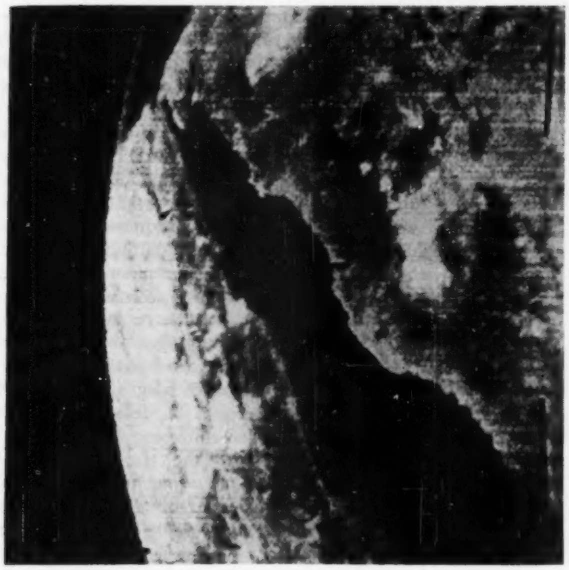


Fig. 3. TIROS III Satellite's view of Red Sea area.

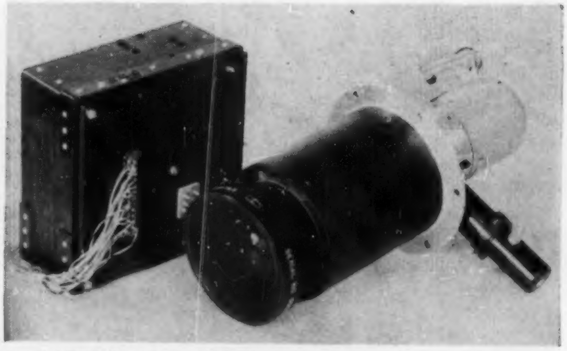


Fig. 4. TIROS wide-angle TV camera.

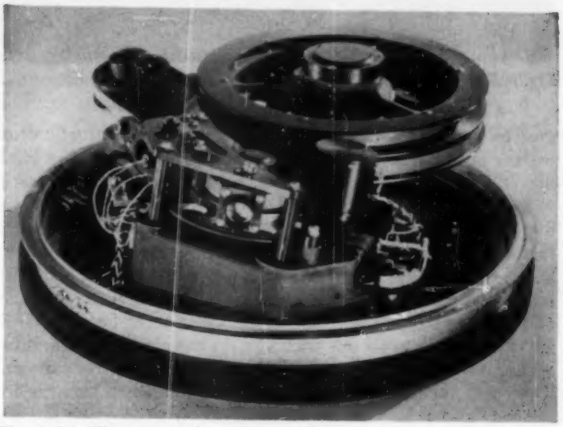


Fig 5. Satellite magnetic tape recorder.

mitted to earth from the three Tiros satellites since the first model was launched by NASA from Cape Canaveral on April 1, 1960. Seventy thousand (70,000) is a lot of pictures. If we reproduced them all in the standard 8 by 10-in. size and ran them in the *New York Times*, for example, the result would be an edition of over 19,000 pages — without allowing any room for captions.

The Tiros equipment is a pioneering example of a television system that meets what we now know to be the minimum requirements for successful performance in space. It was designed from the start to pick up and transmit to earth recognizable images of cloud formations. In the case of Tiros III the objective was even more specific: not only to gather general pictorial and infrared data on the world's weather but also to study the origin and growth of the destructive hurricanes that sweep in upon us from the ocean. At one time recently, the satellite has three of these storms under surveillance in the Atlantic and two in the Pacific.

The now-famous Tiros III, complete with its TV systems, infrared sensors, and associated electronics is shown as Fig. 2. As far as the television systems are concerned, both the assignment and the circumstances under which it is performed have provided us with an interesting challenge — to say the least.

The system was required to operate for three months in space. It had to have programming and storage capability, so that it might be instructed to take pictures anywhere in orbit and hold them for transmission to earth on command when the satellite came within range of a ground station. Two independent camera-recorder-transmitter chains were required, to ensure uninterrupted operation.

The remote picture-taking capability of Tiros is illustrated in Fig. 3, a view of the Red Sea area. This photo, like thousands of others from the satellite, was taken in accordance with programmed instructions fed into Tiros as it passed within range of a ground station in the United States. The image picked up by the camera was stored on magnetic tape in the satellite, to be read out as Tiros came again within communicating distance of one of the two main ground installations on the East and West coasts.

Besides the basic system requirements that have been mentioned, the equipment had to be designed to fit the size and weight limitations for a satellite to be launched by a Thor Delta vehicle. One of the most significant limitations was that of power: the available supply was 28 watts, from a combination of solar cells and storage batteries. This meant that the systems had to be designed for narrow bandwidth operation in order to keep down transmitter power consumption. Narrow bandwidth, in turn, meant a slow-scan system — 2 sec per 500-line TV picture frame.

In Figs. 4 and 5 are shown the two major units of one TV system: the $\frac{1}{2}$-in. vidicon camera that weighs only $4\frac{1}{2}$ lb and uses 8 watts of power (about the same as an electric shaver); and its associated $10\frac{1}{2}$-lb video-tape recorder, which uses about 16 watts and holds enough tape to store and play back a sequence of 32 pictures and then is ready to be used again. These are extremely rugged instruments, employing printed circuitry and transistors to achieve maximum compactness and durability.

The heart of the chain is a rugged $\frac{1}{2}$-in. vidicon pickup tube roughly the size of a cigarette, with a specially developed photoconductive target which we tailored for slow-scan operation and insensitivity to radiation. The storage capability of the target took care of the problem of freezing an image that requires a 2-sec scan, but has to be taken from a satellite spinning on its axis at 9 to 12 revolutions per minute. The picture is taken in a 1-millisecond exposure at $f/1.5$ — enough to impose on the tube surface an electronic image that persists through the 2 sec of scanning.

A full account of the details of this system would require all the pages of a *Journal*. It is enough to point out here that this initial approach has done remarkably well as a starter in spaceborne television systems. The first Tiros ran its course of three months with outstanding success. The second Tiros set a new standard of reliability in space; it is still operational after more than 10 months in orbit. The third Tiros, sent up in July, has produced some remarkable views of the 1961 hurricanes and appears destined to equal the success of its predecessors as the program continues.

It should be stressed that the Tiros system is only a beginning — one that is certain to appear extremely crude by to-

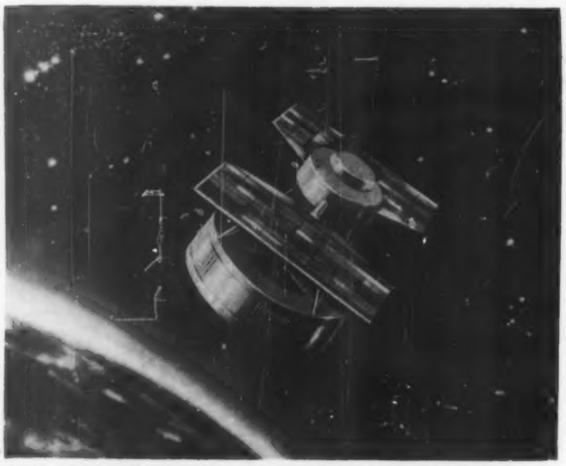


Fig. 6. NIMBUS, next step in weather satellite program.

morrow's standards. It provides us here with a dramatic illustration of the degree to which our technical abilities are challenged by the job of designing imaging systems for use in space.

Even now we are progressing to more sophisticated apparatus for future specialized tasks. The next generation of meteorological satellites, known as Nimbus, is shown here in model form as Fig. 6. The Nimbus satellites will be equipped with more advanced television systems to provide higher resolution and to cover more of the earth at any given time. One class will, for example, carry six one-inch vidicon cameras of considerably higher resolution than is provided by the smaller Tiros cameras. They will incorporate a number of refinements, such as iris control, and gray scale for calibration. The Nimbus satellite itself, unlike Tiros, will be attitude-stabilized in relation to earth, so that its cameras will always be pointing earthward.

An entirely different television system approach is to be used for yet another purpose in the Ranger program to provide us with detailed images of the moon's surface. The second phase of the Ranger program, scheduled to begin next year, will include a 1-in. electrostatically deflected vidicon camera mounted on the spacecraft to pick up images on the approach to the moon. To permit further reduction of bandwidth, the vidicon tube has been designed for longer storage and slower scan. Even by present standards, the resolution will be fairly low — 200 lines — but it is expected to provide sufficiently high surface resolution of features on the moon.

Later in the Ranger program, the vehicle will carry a television mission package designed to send high-resolution pictures of the lunar surface up to the moment of impact on the moon. This project, which was recently announced by the National Aeronautics and Space Administration represents a considerable advance beyond present equipment and will involve an entirely new and more ambitious approach to the design of space television systems.

New Techniques

As we progress in the development of these and other advanced special-purpose imaging systems to hurl into space, the quest continues through research and development for variations or new approaches that may do these other jobs even more effectively. One of the most interesting of these new prospects is shown — the dielectric tape camera.

The principle is relatively simple in concept — but not quite so simple in execution. Images are picked up through the lens system and recorded electrostatically on the specially developed conductive layer of a plastic tape. The stored pictures, consisting of electrical charges in the exposed layer, can be read out by an extremely high-speed scanning electron beam and transmitted in the manner of conventional television. This approach offers a number of major advantages. One is the combination within a single unit of the functions that are now performed by a television camera and an associated magnetic tape recorder. Another, which is even more significant, is exceedingly high data storage capacity.

The electrostatic principle also offers many of the advantages of magnetic tape storage. Images can be stored on the tape for long periods, and read out a number of times before there is significant loss of detail. Yet the tape can be instantly erased by a flooding beam and reused whenever this is required.

Potentially, this is an extremely high resolution technique. We will soon achieve 100 or so optical line pairs/millimeter. The limiting factor is not the grain of the recording material, as is the case with other mediums, but rather the minimum diameter of the electron beam that is used to read out the stored image. Techniques for reducing beam spot size are now making gratifying progress in our research program. As for the system itself, the first space application is scheduled for a phase of the forthcoming Nimbus weather satellite program.

It is appropriate to note briefly one of the related support activities generated by the search for imaging techniques tailored to specific tasks in space. From a visual standpoint, two key questions arise in connection with any satellite or space vehicle project. First: what resolution in required to obtain the information that is wanted? Second: how can we extract the maximum information from the image after it comes back to us?

Equipment has been developed by television engineers to provide answers to both questions by simulating a wide range of resolution, noise and other conditions. [See R. L. Hallows, "Electronic Brightness Contouring"; and J. P. Smith and J. F. Baumunk, "A Television Imagery Simulator"; *Jour. SMPTE, 70:* 23-32, Jan. 1961]. Used in performance studies, the simulator makes it possible for us to determine in advance the quality of images that will be provided by a given type of television system. In this way, we can avoid either overdesigning or failing to meet the standards that are required for the assigned mission. By varying the parameters provided in the simulator, the operator can study on a monitor images ranging from 120 to 1,000 lines in resolution. He can also inject different levels of noise into the picture to simulate the effects of transmission under varying conditions of distance and interference.

The other capability of the simulator is even more exciting from the standpoint of the meteorologist, or the astronomer, or the photo interpreter. Various controls permit the operator to enhance photographs or recorded television images in order to bring out more detail, to outline areas of equal brightness or darkness, or to differentiate in such a way as to produce a three-dimensional relief effect.

These pictures from the monitor show how the enhancement technique can be used to analyze satellite photos of cloud formations. The outlining here picks out areas of greatest brightness, of interest to the meteorologist in identifying regions of uniform thickness, moisture content, or energy levels. For the astronomer, the same technique can outline brightness levels in a nebula, for example, and bring into view stars that may be invisible to the unaided eye against the almost equally bright background of luminous gas. For the photo interpreter, this and other capabilities of the simulator can emphasize terrain and man-made features. Recently, there has been some interesting experimental use of the system to aid in the analysis of medical x-ray photographs.

There is one other intriguing prospect relating to television and space that is worth mentioning here before we pass on to other matters. Before the end of this decade, we expect to have operational communication satellite relays in operation to carry television as well as radio and voice traffic across the oceans and around the world, just as microwave relay towers now enable us to transmit these high-frequency services overland. Those of us who are connected with television broadcasting can only speculate at this point as to the effect that live world-wide transmission may have on the art. But the possibilities are certainly worth thinking about.

Within the next year, the first experimental relay satellites will be placed in orbit. One of them is shown sketched in Fig. 7, the 100-lb active repeater satellite which RCA is now building for the National Aeronautics and Space Administration's Project Relay. A generally similar experiment is in preparation by the American Telephone and Telegraph Company, which is building its own satellites for launching next year by NASA. Both of these will be low-altitude satellites, moving in orbits from 1,000 to 3,000 miles up. A next step will be an experiment to determine the feasibility of a synchronous, or fixed, satellite at an altitude of 22,300 miles over the equator, where its speed in orbit will carry it around the earth during the time that the earth itself makes a complete rotation. Thus the satellite will appear always to remain at the same point in space relative to the ground. At this high altitude, and with its fixed position, such a satellite can cover more than one-third of the earth in its function as a relay station. The first experiment of this type will be NASA's Syncom, or synchronous communications, satellite being built by Hughes.

Motion-Picture Support

But television, as indicated earlier, is only part of the Space Age story. Accompanying the missile and space programs is an equally dynamic new motion-picture technology as revolutionary in its way as the television advances that have been briefly described.

All the way through the chain from basic research to the penetration of space, film has become a major tool of research and engineering as well as the primary means of historical documentation. The fulfillment of these assignments has brought a series of remarkable technical achievements and the growth of a substantial new industry.

One of the major centers of this new industry is the Atlantic Missile Range, with its sprawling launch complex at Cape Canaveral, Florida. In an average missile or satellite launching at the Cape, approximately 30 fixed cameras are trained on the pad and various portions of the flight path to provide a complete visual record of the first 5,000 ft of flight. During this critical stage, the film record is the only fully reliable source of information; until the vehicle rises beyond low altitudes, electronic instruments can be confused by ground clutter consisting of reflected and multiple signals.

The film equipment used in a standard launch runs a gamut from standard motion-picture cameras to highly specialized film recording instruments. A few are installed in blastproof and heat-resistant housings close to the rocket nozzle. A number of the cameras are modified to include a timing code on the picture frames so that various recorded events can be pinpointed in time. Others have been designed for higher operating speeds, up to 1,500 frames a second, to furnish extremely slow-motion playback for study by missile engineers. On more than one occasion, the information supplied by these cameras has enabled engineers to obtain clear slow-motion sequence of events that could not have been detected by telemetry or radar. Color film sequences of rocket exhausts at launching also have contributed substantially to progress in fuel development.

Beyond the immediate launch sequence, tracking cameras and theodolites are used extensively with each project to record the path, velocity and acceleration of the rockets. One of the most impressive instruments now in use at the Atlantic Missile Range is a tracking telescope which has a 24-in. lens opening and a 500-in. focal length. This one is known as the ROTI — an acronym for Recording Optical Tracking Instrument. Its assignment is to produce engineering sequential pictures of specific functions, such as nose-cone separation, at distances up to 100 miles. As a measure of its reach, a B-47 bomber ten miles away completely fills the film frame.

Up to now, perhaps the most accurate photographic information gathered at the range comes from a ballistic plate camera that is used at night to photograph a flashing light aboard the missile against the background of stars. The result is a record which fixes the position of the missile within a very few feet during an extended portion of its flight. The instrument is so accurate, in fact, that it has been used to check the accuracy of other optical and electronic tracking instruments used on Range operations.

The Canaveral family is now being joined by an even more advanced photographic tracker to provide optical data on missile flights. This is a new 600mm, f 2.0 ballistic plate camera which should be able to fix missile positions within 26 ft at distances up to 1,000 miles, using the same technique of recording strobelight flashes from a missile against a star background.

Because of the extensive reliance upon film records, Cape Canaveral has become a major motion-picture center requiring an investment of more than 2 million dollars in film annually. During a typical missile or space launch, up to 35,000 ft of film is exposed. Today, the photo laboratory at the Cape processes nearly 1,000,000 ft of film each month, including 16, 35 and 70 and aerial 5-in., in both black-and-white and color.

A close relative to the Canaveral operation is the growing film activity associated with the Vandenberg Air Force Base in California. To service the missile program at Vandenberg, the Air Force maintains a 200-man motion-picture producing unit at Laurel Canyon in Hollywood. Much of the footage processed by the installation is classified. The extent of its activity, however, is indicated by figures showing production of an average of 175,000 ft of soundtrack per month by its sound recording division.

This continued growth of film activity with missile and space programs provides a direct and constant challenge to motion-picture technology. But it is by no means the only such challenge that faces us in the Space Age. Throughout the widespread and intensive research effort that must continue to produce the materials, devices, and basic designs for tomorrow's missiles, launching rockets, and weapons, new film techniques are constantly in demand as scientific tools for observing events that occur at incredible speeds or in extreme environments.

The use of sufficiently sensitive film and sufficiently fast exposure enables us to capture on film a record of events that occur too swiftly to be recorded in useful form by any other medium.

This is, in fact, the basis of remarkable advances that have been made during the past few years in high-speed photographic techniques for scientific applications that range from plasma physics to the study of high-velocity projectiles and explosives. Most of you have seen in the Society's *Journal* through past months the evidence of lively activity in this field and of the impressive results that are being achieved.

A number of special-purpose systems are now being applied with outstanding success to recording functions that call for exposures in the millimicrosecond range (one billionth of a

Fig. 7. RELAY experimental communications satellite.

Fig. 8. Space Electric Rocket Test Capsule which will test electric propulsion engines for use in interplanetary travel.

second) and precisely synchronized spark explosive, and rotating mirror light sources. These systems are shedding new light on high-speed airflow phenomena, ballistic missile design criteria, re-entry effects on materials, and other problems of concern to space scientists. Sweeping-image and sweep-camera techniques of advanced design now permit the study of high-velocity projectiles in trajectory, and the manner and rate of burning of solid fuel for rockets.

Combinations of electronic pickup and film recording methods have opened the way to progressively higher imaging speeds. One of the most spectacular examples is a recent experimental system that employs an image-converter tube and film recording combination in a camera that can take 20 million frames a second, with shutter speeds up to 2½ billionths of a second. This instrument is being used in plasma physics research, including the study of electronic propulsion techniques for vehicles traveling through space.

The Space Age Challenge

This hasty review of motion picture and television in the Space Age is intended not so much to inform as to stimulate all of us. The growing emphasis upon missile and space technology presents us with a broad and constantly expanding field for the introduction of new concepts and techniques in visual communication. Many of these concepts and techniques will be applicable to the older established fields with which we have been principally concerned, and to the burgeoning demands in education and all phases of scientific research.

Some of these new techniques will come from future space vehicles such as Project SERT, the space electric rocket test vehicle which will be launched into space for the first test of electric propulsion, shown in Fig. 8, and Project RANGER space vehicles (Fig. 9) designed to land on the moon, or a spin-stabilized wheel satellite (Fig. 10) which will literally roll around its orbit, or an inflatable space station.

As a professional society, we are challenged by this new age to extend our interest and our ingenuity in ever-greater measure into new technical areas where the complexity of the problems is matched only by the breadth of opportunity that can open before us with their solution.

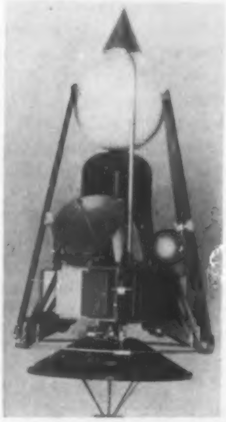
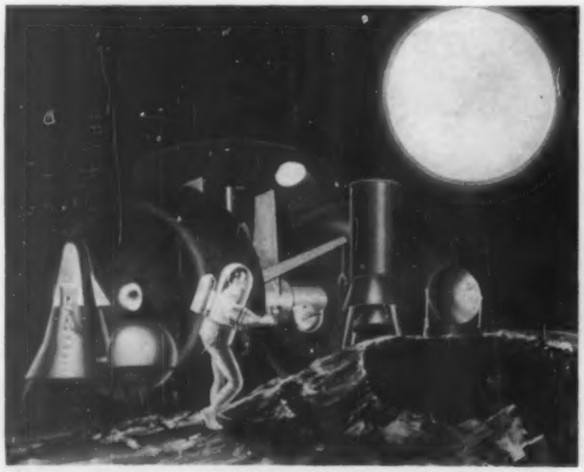
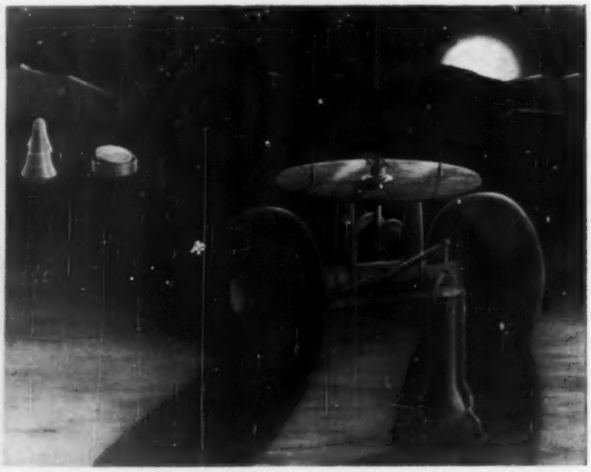


Fig. 9. NASA's Project Ranger in launch position.

Fig. 10. Spin-stabilized satellite concept.





Figs. 11 and 12. In the future both unmanned and manned lunar exploration will utilize television and motion-picture equipment.

The 1961 International Standards Organization Technical Committee 36 Meeting

By DEANE R. WHITE

Representatives from the national standardizing bodies of ten countries met at Garmisch-Partenkirchen, Germany, to carry on the work of ISO/TC 36, Cinematography. The work covered a wide range of subjects affecting, in various ways, international business in the field of cinematography. Five current situations outlined illustrate important aspects of the work. Seven Working Groups were authorized to continue work on the uncompleted projects. Continuation of these activities is important to United States industry in this field.

The fourth meeting of International Standards Organization, Technical Committee 36, Cinematography was held at Garmisch-Partenkirchen, October 16–20 inclusive, 1961. The German standards organization, Deutscher Normenausschuss, had cared for the local arrangements and the German photographic industry acted as co-hosts to assist in the pleasant social elements which fitted into the busy schedule of technical meetings.

Representatives from ten nations attended: Austria, Belgium, France, Germany, Italy, Japan, Netherlands, Switzerland, United Kingdom and the United States. Austria and Japan have observer status in TC 36, whereas the other nations are active members. The members of the U.S. delegation were Alex Alden, Staff Engineer of the SMPTE, E. K. Kaprelian of the Signal Corps, R. N. Linkhart of Du Pont, C. S. McCamy of the Bureau of Standards, J. G. Mulder of Kodak and the writer. Paul Arnold of Ansco became the chairman of the meeting and C. E. Hilton of ASA took charge of the work of the Secretariat in which he was greatly assisted by A. Cherif of Kilborn Photo Paper Co.

Serious European Attention

From the general tenor of the meeting it was evident that the European nations take this international standardization work very seriously, probably more seriously than it is weighted in the U.S.A. as a whole. This difference is quite understandable in view of the differences faced in the production and sale of films for theater and television usage. The U.S. market is itself large and the national, ASA, standards developed cover well this one large market. In addition, we, in the U.S.A., have been pioneers in much of this work and accordingly have had the advantage that early exploitation gives to acceptance of practices as they are developed. This lead has been significant and we have the satisfaction of seeing many of our national standards taken over rather completely at the international level. This is not universally true and there is evidence which can be interpreted as a trend away from this past favorable situation. There is nothing alarming in this trend, per se, but it does mean that U.S. industry must keep increasingly careful track of trends and developments in other countries in order to assure itself that it will continue to offer, to international friends and customers, products in a form that will meet their technical requirements.

A complete report of the actions taken by ISO/TC 36 will be made by Alex Alden, SMPTE Staff Engineer, in an early issue of the *Journal*. I have selected for discussion five technical items illustrative of the types of situations confronting us at present.

Television faces common problems, regardless of country, when using motion-picture films as the long time storage medium for its programs. Picture cropping is anticipated in stepwise sequence between the picture shown originally in the viewfinder of the camera and the final reproduction on the home receiver. This has been faced in the U.S.A. and concepts introduced and defined as "Transmitted Picture," "Safe Action Area" and "Safe Title Area" to guide production into channels which will result in interchangeability of the ultimate product. These three basic ideas are recognized internationally under the names "Transmitted Picture," "Action Field" and "Safe Title Area" in a Draft ISO Proposal authorized for circulation to TC 36. Our position is well defined with regard to the "Transmitted Picture" from 35 and 16mm motion-picture films and 2 by 2 slides in PH22.95, PH22.96 and PH22.94, respectively, and the proposal authorized at Garmisch is in agreement with U.S. standards. The U.S. practice regarding "Safe Title Area" is also embodied in this international proposal. There remains a difference between current U.S. thinking for "Safe Action Area" and its counterpart "Action Field" as the latter is a few per cent smaller than the former. The significance of this is yet to be determined. We have benefited from the timely work done in the development of our existing standards and these related proposals.

8mm Sound Films

Great interest was expressed in progress in 8mm sound motion pictures. Our own work of standardization in this field is not complete and accordingly we were not prepared to make full official proposals for international standards. However, one Draft ISO Proposal covering the picture-sound separation distance had been scheduled for discussion. This proposal is in agreement with U.S. practice as that is developing. One request had been received to recognize a second separation distance in accord with design of one maker who wished to manufacture a conversion kit for a type of silent projector. This request was not accepted; the single picture-sound separation distance was left as the only one recognized for the interchange of film. The interest manifested by the other countries led to the acceptance at the same time of a projection rate of 24 frames per second for films for international exchange with an alternate rate of 16–18 frames per second noted as one which might be encountered under other circumstances, notably with equipment designed for recording and replay in the same machine. The position and width of the magnetic stripe were specified and agree with our own standard PH22.88. Just what spot 8mm films will find in international business remains to be demonstrated, but some people expect it to be significant. The way is smoothed by these agreements.

Exhibition Films

At the Harrogate meeting of TC 36 in 1958 a request had been received from Russia asking consideration of standardization of "complete sets of materials necessary for the international exchange of films and co-productions." The Secretariat (ASA) was instructed to determine the degree of interest in this on the part of the member countries. The inquiry was made in 1961, shortly prior to the meeting of TC 36. There are some aspects of the original proposal which are unattractive

A contribution by Deane R. White, SMPTE Engineering Vice-President and Chief Delegate for U.S.A. to the ISO Technical Committee 36 Meeting at Garmisch-Partenkirchen, Germany.

to us and the official U.S. position was to oppose attempts to set standards in this field. However, that view did not prevail and an Interim Working Group was authorized to study these proposals more. The French were given the chairmanship of this group and in outlining their views of the relative importance of items to be considered, emphasized phases which could be important to our export of finished films and de-emphasized some of the more objectionable points of the original proposal. Accordingly, as the Chief U.S. Delegate, I indicated a desire to participate with France and Germany in studying this further. It should be worth someone's time to keep in touch with the ideas developing in this field.

The international reaction which was evident to motion-picture film with four magnetic soundtracks was unexpected. This proposal originated with the "Cinemascope" system and the Draft ISO Proposal under consideration at Garmisch represents this practice. The French delegation considered that, if four tracks are to be used, better results can be obtained by departing from the older practice by making the fourth stripe wide enough to be a full-fledged sound track in its own right rather than a narrow track limited to control function only. The French indicated that they expect to develop further data on the entertainment value of such altered (improved?) four-track film. Germany took the chairmanship of a group to work in this field with France, Italy, Netherlands and the United Kingdom participating. In the meantime, information on the nature of the present system will be available in the documents being processed as a Draft ISO Proposal.

It is of some interest to note that the French are opposed to the acceptance of the CS (CinemaScope) perforation, hole 0.078 in. wide by 0.073 in. high used with today's film with four tracks. They prefer the older KS (Kodak Standard) perforation, 0.110 in. wide by 0.078 in. high, but say they are studying a rectangular perforation 0.078 in. wide by 0.078 in. high. The argument for one standard perforation for 35mm motion-picture films is thus continued.

Interest has developed in Europe in a form of 35mm motion-picture film not recognized in the U.S.A.: a form with one magnetic stripe over a normal optical soundtrack and with a balancing stripe outside the perforations along the film edge more distant from the soundtrack. Such a film had received test in the United Kingdom and one contemplated usage was cited, far removed from customary U.S. practice. In this usage, the function of the magnetic track is to permit the preparation of a sound record with the dialogue in the language required for use in a particular country, and at the same time provide for the later erasure of that record and re-recording of another track in a different language. Finally, according to the United Kingdom suggestion, after foreign distribution is completed, the entire magnetic stripe would be washed off and the print left with its hitherto unused optical track in its original language, and the film would spend its remaining useful life in this one country. The statement was made that the problem of cleanliness of washing had been met and that in fact the process had been proved technically feasible. There is little reason to anticipate need for a corresponding practice within the U.S.A., but if such a film is actually to become an article of commerce and a means of international exchange of program material, we will surely want to know about and evaluate it. The proposal is to be circulated for consideration as a Draft ISO Proposal.

The work at Garmisch is a significant step forward in the continuing effort to promote international business through wide acceptance of uniform technical practices. The face-to-face discussions cleared up rapidly many differences of opinion which still remained after much letter writing. The ASA, as Secretariat, faces a considerable load of careful detail work in the preparation and circulation of the documents required in carrying out the instructions given it at Garmisch. This work is unspectacular but very necessary to permit the final careful consideration of the proposals made.

Seven Interim Working Groups were authorized to continue work not completed at Garmisch. It was the expressed opinion of Committee TC 36 as a whole that the memberships of these working groups should be kept as small as practicable. The working areas of the groups and proposed organization are indicated as follows:

Luminance of Screens (35mm Review Rooms and 16mm Theaters): France (Chairman), Germany, United Kingdom. No U.S. representation was requested. Proposed ASA Standard PH22.133 states clearly the present U.S. position regarding 35mm review rooms and there is no current activity here regarding 16mm usage in theaters.

Spools and Cores and Packaging: U.S.A. (Chairman), Belgium, France, Germany, Italy, Switzerland. This continues work with some enlargement, previously in progress under U.S.A. chairmanship.

Film Leaders and Trailers for 16mm and 35mm Films: United Kingdom (Chairman), France, Germany, Italy, U.S.A.

Film Dimensions (32, 65 and 70mm Films): Germany (Chairman), Belgium, France, Italy, U.S.A.

Magnetic Soundtracks (One or More on 35mm Film): Germany (Chairman), France, Italy, Netherlands, United Kingdom. The U.S. position with regard to four magnetic tracks, expected to be the main topic of this group, was outlined in an earlier paragraph of this report.

Camera and Projector Apertures and Sound Track Locations for 65 and 70mm Film Usages: U.S.A. (Chairman), France, Germany, Netherlands.

Sets of Materials for the International Exchange of Films: France (Chairman), Germany, U.S.A. This situation was outlined in an earlier paragraph of this report.

It is hoped and expected that U.S. industry potentially affected by this work will be pleased with progress made and will furnish the support needed to continue this work.

Principle and Proof of a Simultaneous-Writing High-Speed Streak and Framing Camera Concept

By L. R. TEEPLE, JR.

A simple principle of a simultaneous recording of both streak and framing record of the same event makes possible direct separate frame observation during streak recording of high-speed events. The system permits progressive, full-frame identification from the same observation point of phenomena often difficult to identify with certainty on a streak record alone.

THE DEVELOPMENT of the simultaneous-recording concept for streak and framing camera was based on a ultilization of the unique qualities of a rotating mirror as a light scanning and shuttering device. A rotating-mirror framing camera operates most efficiently in the 20,000 to 50,000,000 frames/sec range. The rotating-mirror camera as a streak camera is most efficient in the 0.5 to 50 mm/μsec writing rate range.[1] Usefulness is attained outside this range, but where predominant use is outside this range, information theory and simple economics indicate that consideration of other recording devices is in order. However, the range of usefulness is extremely broad, and concentration of study on utilization of the high-speed rotating mirror as an adjunct to high-rate data recording has yielded gratifying results.

The rotating-mirror camera, with optimum use of its essential elements, can record information at the rate of 10^{11} bits per sec. A "bit" of information, in the photographic sense, is the smallest controllably variable area in a picture. For example, a "bit" of information in a halftone reproduction of a photograph is one of the small dots of the entire matrix; one square inch of advertising grade of halftone contains about 15,000 "bits" of information. By comparison, broadcast television gathers information at the rate of 10^7 bits, or information points, per second, which is quite satisfactory for viewing of events normally available to human perceptibility.

Also by comparison, reactions such as electrically exploded bridgewires, which tend to disintegrate in less than 0.01 μsec, have as yet escaped entirely satisfactory direct two-dimensional photographic recording. This is predicted in theory, as a reaction essentially complete in 10^{-8} sec permits a sequence of ten pictures, for example, assuming no overlap in exposure from one to the other, with only 100 information points in each picture. To give this a physical meaning, rule a 35mm cine frame (18 by 25 mm) with ten equally spaced lines in the width and in the length direction; then color in the squares in the shortest path diagonally across the frame. This is the quality of the edge of the subject taken under these conditions, provided the picture is 18 by 25 mm in size. Admittedly, the picture thus recorded contains scarcely enough information to identify the subject or measure changes in its velocity and position.

The rotating-mirror camera can be used to yield high-quality information in such rapid events by the simple expedient of making the frame or picture size smaller in the direction of light-beam sweep. By decreasing the picture size to 0.001 in. in width while retaining the 1-in. length, one dimension of the picture is virtually eliminated. A picture thus produced contains almost no two-dimensional information. However, if the part of an event to be critically examined is contained in the narrow frame, with the frame oriented so that the action to be observed is along the length of the frame, we have a unique situation. By moving the narrow frame, oriented so that the frame is parallel to the rotating-mirror axis, along the film which is cylindrically oriented with its axis of curvature parallel to the mirror axis at the extremely high but accurately known rate of speed possible with a rotating mirror, we can record the progress of the event in the line up and down the narrow frame.

With this arrangement, we obtain a time-position relationship of the event, as shown in Fig. 1. This picture also contains information recorded at the rate of 10^{11} bits/sec, but since the picture is only 0.001 in. wide and 1 in. long, we can determine the time-position relationship of the event within the narrow field with excellent accuracy to well under a hundred millionth of a second. The verity of the relationship has been tested by defining the time-position variation of a single event viewed through light paths differing in length by 6 ft; the event routed over the two paths would of course arrive at the film as two images 0.0066 μsec apart. The time-position relationship of this event was verified with a time definition of 0.00458 μsec, or with an accuracy of measurement of about 0.4 standard deviation.

Although the "streak" picture of Figure 1 contains information of excellent quality and content, the exact interpretation as to the source of each variation in density on film is to most people an exasperating puzzle, and even to the physicist familiar with the subject, occasionally baffling and tedious to analyze.

The ideal situation, to provide direct and unequivocal interpretation of the streak record, would be to record the same event in two-dimensional still pictures from the same viewpoint, with the capability of identifying the activity between the two records thus obtained with close correlation of the time and space positions involved. Available to the analyst would be two important tools: finely detailed time-space measurement information, and a sequence of qualitative two-dimensional record pictures of everything that occurred in view of the camera, each recorded on the same time base. This ideal is in fact achieved by placing the elements of both the framing camera and the streak camera

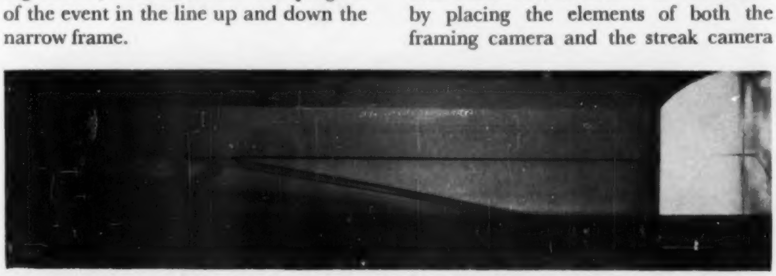


Fig. 1. Streak record of explosively induced shocks in trapezoidal slab of Lucite. The static picture on the right shows the Lucite block and slit position before detonation. Streak writing rate: 5.5 mm/μsec.

Presented on May 8, 1961, at the Society's Convention in Toronto by L. R. Teeple, Jr., Beckman & Whitley, Inc., San Carlos, Calif.

(This paper was received on May 22, 1961.)

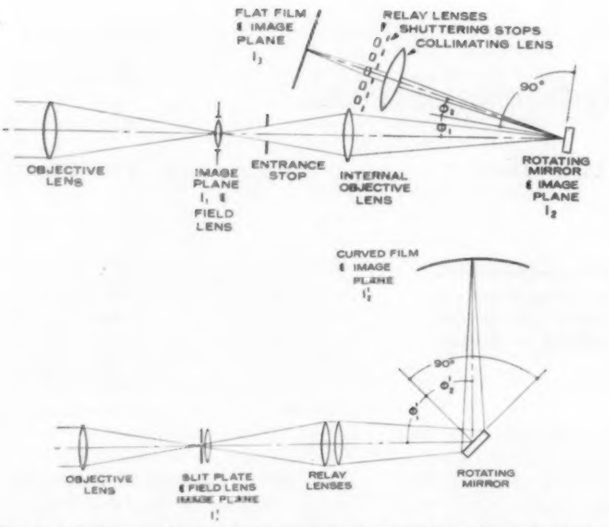


Fig. 2. (a) Above, diagram of elements of a rotating-mirror framing camera; (b) Below, diagram of elements of a rotating-mirror streak camera.

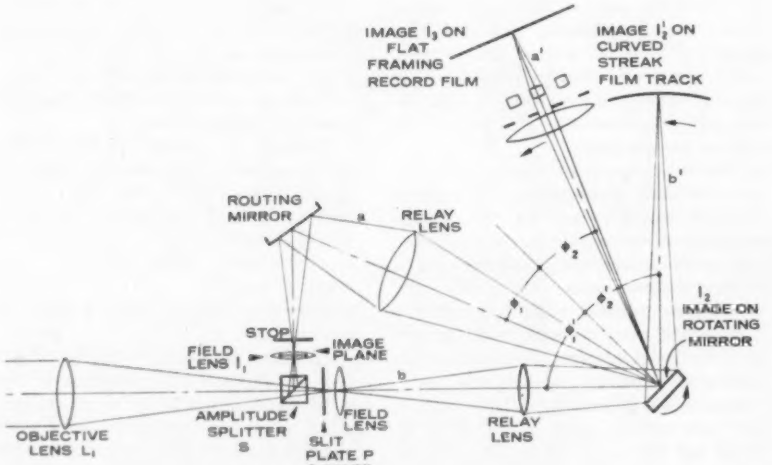


Fig. 3. Arrangement of elements of framing and streak cameras for common use of the rotating mirror to achieve simultaneous writing.

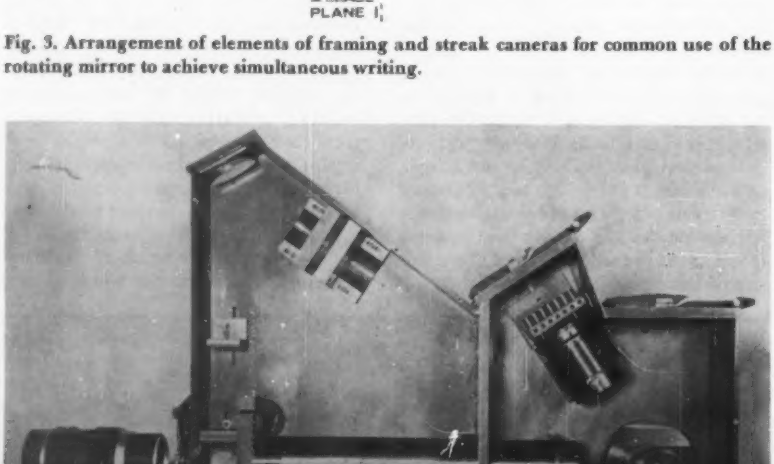


Fig. 4. Breadboard model of simultaneous-writing camera with the side cover removed. Optical elements conform closely to positions shown in Fig. 3.

so as to cause recording simultaneously, each in its own peculiar way. If we take the framing camera system of Fig. 2(a) and the streak camera system of Fig. 2(b) in spatial relationship on the plane centered on the rotating mirror and perpendicular to its axis of rotation, in the manner of Fig. 3, simultaneous recording will be achieved.

The incoming beam of light is split behind the objective lens L_1 by means of a half-silvered splitter S so that an image and light beam is directed upward to serve the framing camera imaging and shuttering system. Light passing through the splitter images on the streak camera slit plate P. The light path of the framing camera is routed so that $\Phi_1 = \phi_2$, while for the same position of the rotating mirror, the light path of the streak camera has the relation $\Phi_1' = \Phi_2'$. The establishment of this angular relationship of elements, the exact placement of which is dictated by the dimensions of the optical elements, enables the camera to record simultaneously as a framing camera and a streak camera.

It is apparent that the elements of Fig. 3 can be arranged in many ways to achieve the same result, as long as the basic relationships of the optical paths and the rotating mirror are maintained. Figure 4 shows the actual breadboard camera used in experimentation and in taking the pictures of Fig. 5. The production-engineered version will undoubtedly be esthetically less offensive.

Some of the interesting variations of the configuration involve modularizing the concept so that the basic device may be used as a streak camera only, or as a framing camera only, or as the simultaneous-writing camera. Another interesting variation is the use of beam splitters of various degrees of reflection and transmission. As the effective exposure time of the framing camera is inherently much greater than that of the streak camera, the exposure level of each can be controlled by proper beam split-

ting without wasting available light by use of neutral density balancing filters.

The various physical features, such as lenses and film holders, of the breadboard model of Fig. 4 were selected as part of an experiment to see how inexpensively the camera could be constructed without compromising the essential qualities of an intermediate rate high-speed camera. For this reason, the framing-camera film record, seven pictures, 0.4 by 0.53 in., contiguous in a row on 4 by 5 flat film, was quite adequate for the framing camera. The stringent requirements of dimension control and linearity of record dictated the use of $5\frac{1}{2}$ in. of 35mm film on a curved track in the streak camera. Typical performance for the camera is:

Framing Camera: Seven to twelve pictures, at a maximum aperture ratio of $f/10$, with exposure times between 0.15 and 0.7 μsec at 600,000 frames/sec.

Streak Camera: $\frac{3}{8}$ by 1 in. max. field, 6mm/μsec writing speed, 20 μsec writing time, aperture ratio $f/6.3$, linearity within 0.5%.

Simultaneous Writing Camera: Same as above except that the aperture ratio, with 50/50 splitting of light, is $f/17$ for the framing camera and $f/11$ for the streak camera.

As can be seen from the records in Fig. 5, which were chosen from several as clearly demonstrating both the practicability and utility of the concept, a hairline in the framing-camera record shows the precise location of the slit field of the streak camera.

If the utility of the simultaneous writing camera to the research group of Beckman & Whitley, Inc., is any indication, the concept should fill a long-endured need in photographic instrumentation technology.

References

1. Thomas E. Holland, "Study of resolution limits in high-speed framing cameras," *Proc. 5th International Congress on High-Speed Photography*, SMPTE, 1962, pp. 430–437.

Fig. 5. Simultaneously recorded streak and framing records. The hairline in the framing camera pictures shows the slit position.

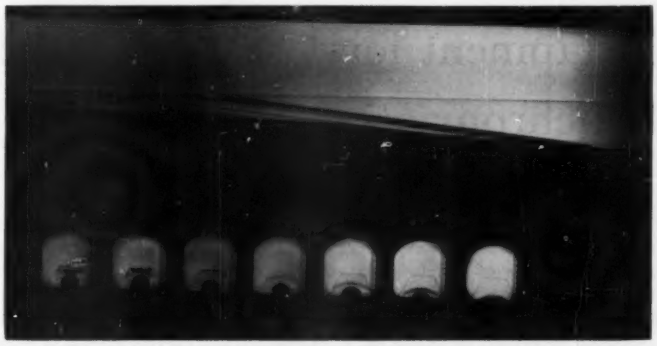


Fig. 5 (a). Explosively generated shocks in Lucite slab, similar to Fig. 1. Note the appearance of rupture zones in both records.

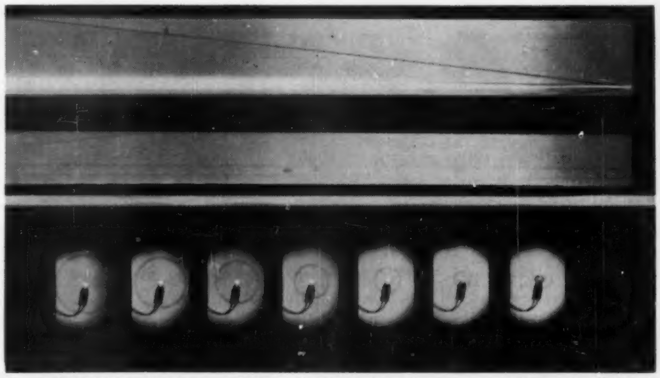


Fig. 5(b). Electrically exploded bridgewire in water. Note the shock wave reflecting between the bubble and the bridgewire base.

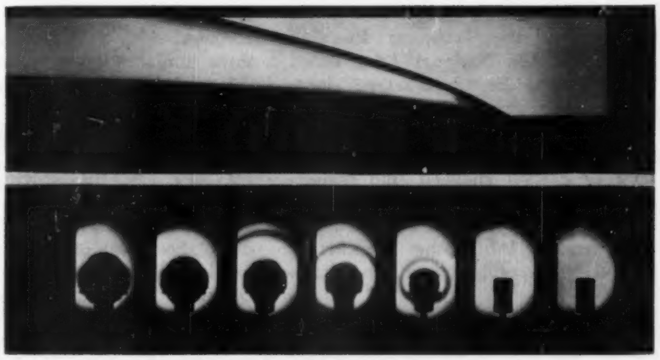


Fig. 5(c). Detonator explosion in water.

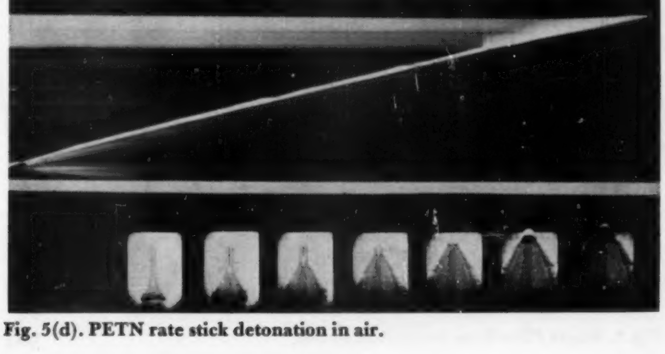


Fig. 5(d). PETN rate stick detonation in air.

Modifications of Tape Reproducing Equipment for Use With the Pilot-Tone Synchronization System

By RUDOLPH R. EPSTEIN
and LEO H. O'DONNELL

Motion-picture production requirements for lightweight synchronous location equipment demand battery-operated cameras and magnetic recorders. The speed variations of the location equipment are recorded on a low-frequency control track at the center of the $\frac{1}{4}$-in. tape perpendicular to the program modulations. The recordings are reproduced and speed corrected with a playback synchronizer originally designed for a high-frequency carrier system of synchronous recording. The modifications of the synchronizer for this additional use are described and performance data given.

National Film Board location crews cover vast distances in Canada and abroad. Equipment has to perform under the widest range of climatic conditions. On the more distant location assignments very often only one sound technician can be transported from Montreal headquarters. Camera and sound equipment has to be compact, lightweight and capable of operating for long periods of time with battery power supplies. Some films require half-hour length continuous lip-sync takes, often with several cameras covering the event simultaneously. Productions for nontheatrical or television release are generally on 16mm film; 35mm film is used for theatrical distribution subjects.

To meet the size, weight and power requirements the Technical Research Division of the National Film Board has developed the "Sprocketape" location recorders for perforated $\frac{1}{4}$-in. tape.[1] Originally designed in 1955 as a button-on unit for Auricon 16mm cameras, they were soon changed into double-system operation. Eight such units were completed by 1956 and have given reliable service. While the Sprocketape equipment is compact and can accommodate a recording time of 33 minutes on one single 7-in. plastic reel, recorder and camera drives depend on 115-v single-phase synchronous motors with their inherent high power consumption. Therefore, comparatively heavy storage batteries and an inverter are required to provide this motor power. To get even more portable location sound equipment, two lightweight transistorized and speed-regulated tape recorders were introduced in 1959 and put into operation for nonsynchronous sound effects and reference recordings on unperforated $\frac{1}{4}$-in. tape. Several manufacturers produce equipment of this type suitable for professional recordings. The recorders used at the National Film Board were manufactured by the Swiss firm Nagra-Kudelski. After a satisfactory trial period three similar Nagra recorders, but with the addition of Pilot-Tone facilities, were added in 1960 (Fig. 1).

In this model an auxiliary control track head is mounted between the playback and the program recording heads. A low-frequency control track of approximately 20-mil width is recorded down the center of the $\frac{1}{4}$-in. tape. The low-impedance control track head receives its high-frequency bias from the program recording oscillator and the external synchronization signal is connected to the control track head without additional amplification or equalization. A potentiometer is used to adjust the control track level which can be measured with the VU meter. A telephone switchboard type indicator operates when the external control signal is ON. Track position and signal amplitude conform to the proposed German standard DIN 15 575 for the Pilot-Tone system of synchronization in which the polarization of the control track is displaced 90° from the audio track. A tolerance of $\pm\frac{1}{2}°$ is given (Fig. 2).

A calibrated test tape, obtained from the Institut fuer Rundfunktechnik in Munich, the research organization of the German Broadcasting Studios, has single frequency reference levels on its audio track and the Pilot-Tone control track at its normal level. Its purpose is to set the proper signal relationship of both components, and for head alignment. The Pilot-Tone recording circuit of the Nagra recorders can operate with sync signal voltages from 0.75 to 1.5 v at an input impedance of approximately 40 ohms.

If the recorder is used with Arriflex cameras, the Pilot-Tone control track voltage is obtained from a small generator mounted in the camera and geared to its drive. Changes of its output frequency will therefore represent the speed variations of the camera. At the National Film Board the control track generators have been added to existing cameras. Governor-controlled d-c motors are used and the usual 7.5-v camera storage battery is the only external power source (Fig. 3). The high mechanical noise level of the cameras available to us at this time makes necessary an efficient blimp for most interior sound shooting. For clarity the camera is shown without a blimp in Fig. 4. With increasing interest in this kind of equipment, undoubtedly quieter

Presented on May 10, 1961, at the Society's Convention in Toronto by Rudolph R. Epstein and Leo H. O'Donnell, National Film Board of Canada, P. O. Box 6100, Montreal 3, Quebec.
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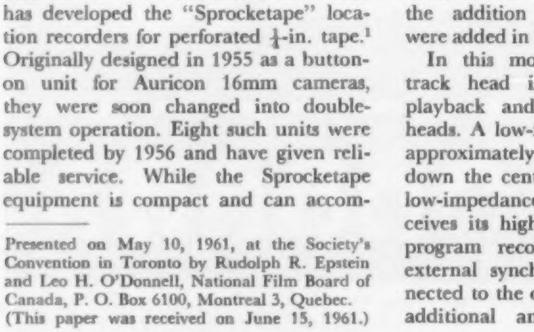

Fig. 1. Nagra Pilot-Tone location recorder.

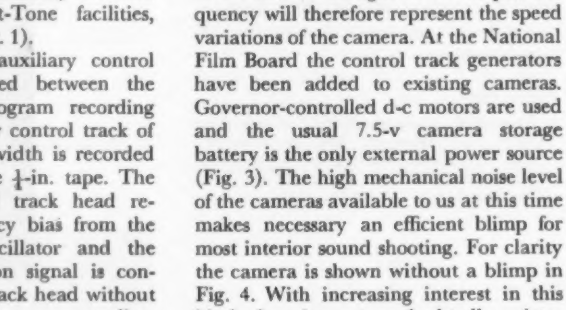

Fig. 2. Proposed German Standard DIN 15 575 for $\frac{1}{4}$-in. magnetic tape with Pilot-Tone control track.

and more portable cameras will be developed in the near future. The recorder operates without appreciable mechanical noise and can be used close to the microphone.

When a-c is available any conventional camera with synchronous motor drive can be used, and the control track input derived from the supply line via a suitable transformer.

The equipment combination illustrated in Fig. 5 is as used for lip-sync takes up to 33 minutes. While the camera motor and the control track input receive power line a-c, the recorder operates from its twelve internal 1.5-v batteries. Its speed regulation is very stable and the power consumption remarkably low. While the flashlight batteries are sufficient in most cases, even more economical operation is possible from external batteries or a small a-c operated power supply. A cable connector is provided for this purpose.

In some news and documentary film productions it will be desirable to eliminate the need for a control track cable or a common power line. We understand that this has been accomplished by use of two separate frequency sources of great accuracy: one for the camera motor drive, the other connected independently to the control track input of the recorder. Another approach suggests a radio link between the camera control track generator and the recorder.

In most professional film recording operations the original production tape will be transferred to perforated magnetic sound recording film for edge numbering, sync rushes, screenings, editing, scoring and re-recording. This method is used at the National Film Board.

In the past 15 years several efficient systems have been developed to achieve the speed corrections necessary for complete synchronization between the original tape recording and the film recorder during transfer. Figure 6 shows one approach in which the studio playback machine reproducing the original tape is driven by its synchronous motor from the power line at normal speed in the usual manner. The control track playback head connects through a preamplifier to a power amplifier which delivers sufficient output to feed the sync motor of the sound recorder producing the copy. This recorder will therefore follow the variable speed conditions of the camera drive during the shooting of the picture. But, it is obvious that an interruption of the control signal will impair the synchronization. Therefore, other systems were developed using an indirect method of synchronization.[2–4]

The principle of a servo system of synchronization is illustrated in Fig. 7. A mechanical differential is coupled with two identical synchronous motors. One receives the control track output through

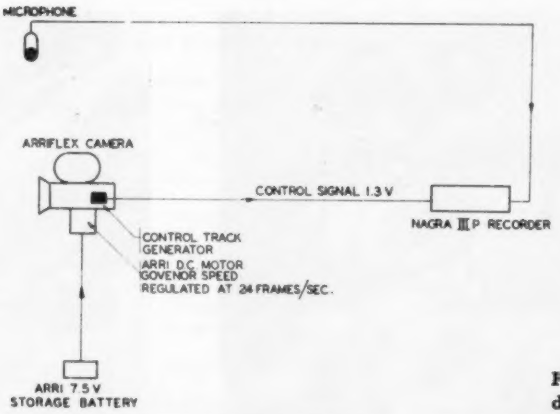

Fig. 3. Block schematic of d-c camera operation.

Fig. 4. Location unit with Arriflex camera.

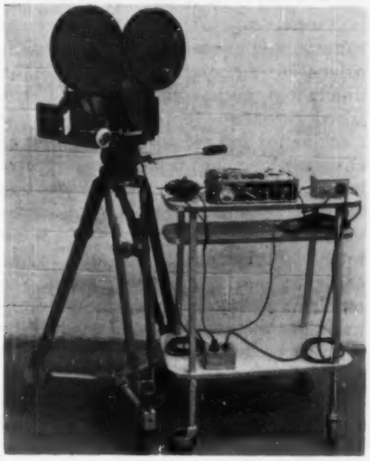

Fig. 5. Location unit with Auricon camera.

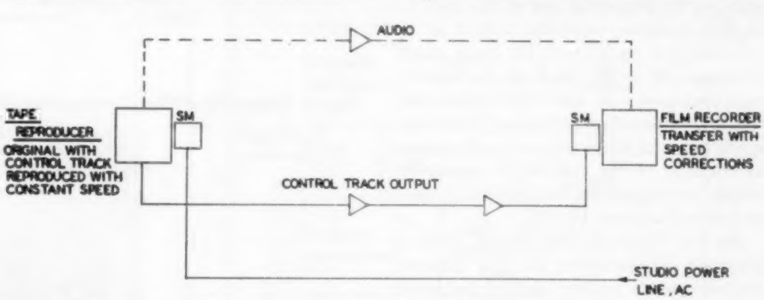

Fig. 6. Block schematic of direct system of synchronization.

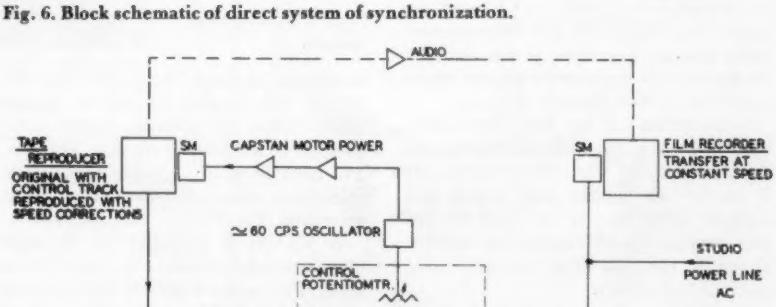

Fig. 7. Block schematic of indirect system of synchronization.

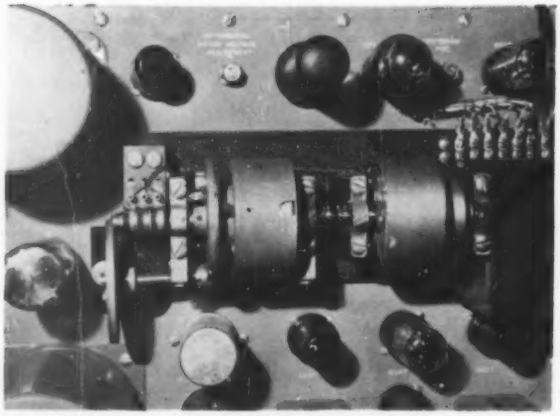

Fig. 8. Differential of Ampex playback synchronizer.

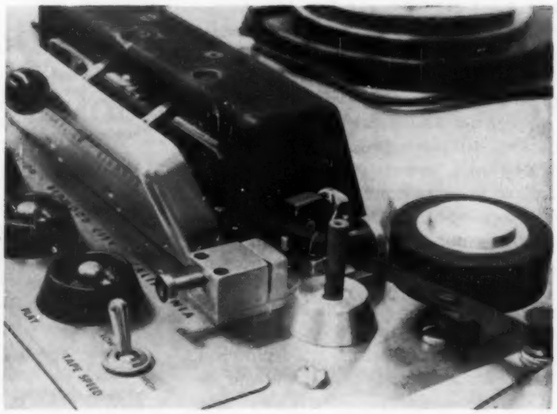

Fig. 9. Pilot-Tone head mount.

suitable amplifiers. The other motor is driven by the studio power line. The differential output shaft expresses the speed deviations between the control track motor and the power line motor as changing angular displacements representing the phase difference. Linked to the differential is a control potentiometer which will alter the frequency of a nominally 60-cycle audio oscillator in accordance with these displacements. The oscillator output is amplified and connected to the capstan motor of the tape reproducer during sync playback of the original recording.

Selsted's Servo System for the Ampex Corp.[4] operates on the same general principle. In this design he has ingeniously eliminated the need for a differential gearbox by mounting one of the motors so that its stator assembly as well as its rotor is free to rotate. Its rotor shaft is connected to the shaft of the rigidly mounted motor so that both armatures rotate together. Any difference in driving speed between the two motors will appear as rotation of the free stator assembly which is coupled to the frequency control potentiometer (Fig. 8).

At the National Film Board such a playback synchronizer for the Ampex high-frequency carrier method has been in operation since 1951 and is used for studio recordings with the 14-kc control track system. Therefore it was decided to modify this equipment for the additional use of Pilot-Tone.

A mounting for the Pilot-Tone playback head was designed and constructed at the National Film Board (Fig. 9) It can be installed on Ampex machines without difficulty as its base utilizes the capstan motor mounting screws. If not in use, the head can be moved out of the tape path.

An additional preamplifier was built for the Pilot-Tone playback head to supply the necessary 200 mv required at the input to the existing control circuits. As the level at the 50-ohm Pilot-Tone head is −80 dbm, the preamplifier was designed to have a maximum gain of about 30 db, with a 6-db/-octave roll-off after 60 cps to reduce white noise or program audio components in the control circuits. The control track level is purposely kept low to minimize cross-talk into the audio recording (Fig. 10).

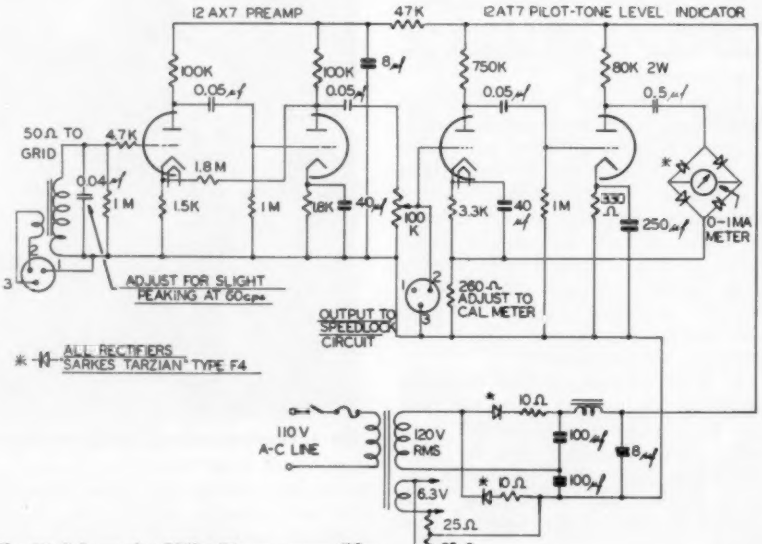

Fig. 10. Schematic of Pilot-Tone preamplifier.

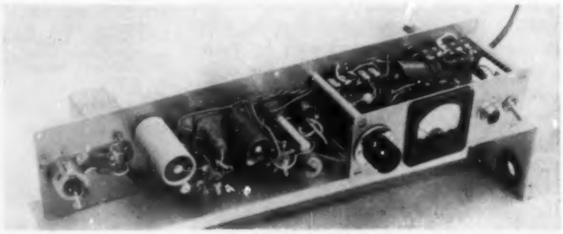

Fig. 11. Preamplifier chassis.

A VTVM is provided on the same chassis which indicates the control track level. The power supply is also included on this chassis. The preamplifier output connects into the control circuits through a switch which was added to select the appropriate control track system (Fig. 11).

The complete installation is shown in Fig. 12. As an operating convenience, a d-c voltmeter and a centering control for the oscillator circuit were added to the front panel of the playback synchronizer. This meter indicates the position of the oscillator control potentiometer in the servo differential. The oscilloscope gives an instantaneous comparison between the control track and the power line frequency as a semicircular pattern. The display is a circle or a 1:1 Lissajous figure derived from the a-c supply through a 90° phase shift circuit in the usual way. The cathode-ray tube beam current is set near cutoff for no signal to the grid. When the control track signal is applied, it cuts off the beam negative half-cycles and in-

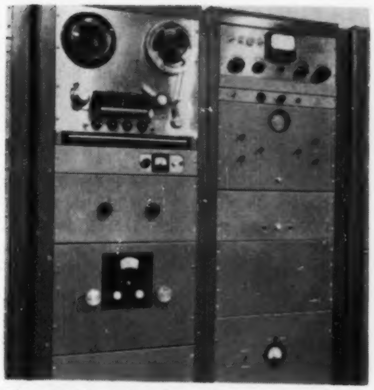

Fig. 12. Complete installation of playback equipment.

Table I. Performance Data of the Location Recorder and Playback Synchronizer.

Equivalent Input Noise	Nagra recorder −124 dbm
Harmonic Distortion .	Nagra recorder at 0 db 2% (Nagra VI Meter)
Flutter	Nagra Recorder 0.03% at 3 kc
Overall F-Response. .	±1.5, 50–10,000 cps at 7½-in./sec
Signal-to-Noise Ratio.	Pilot-Tone — OFF: 63 db Pilot-Tone — ON: 58 db
Control Range. . . .	−16% to 8%
Camera 4 frames/-sec under speed	Sync signal 50 cps
Camera 2 frames/-sec over speed	Sync signal 65 cps

tensifies it on positive half-cycles. The position of the crescent so produced is an indication of the phase angle between the instantaneous sync track signal and the a-c supply. When the crescent is stationary, it is indicating constant phase angle between the sync track signal and the a-c line; meaning the ¼-in. tape original is playing back at synchronous speed. If the tape runs too fast, the crescent figure will rotate clockwise; slow tape speed will be indicated by counterclockwise rotation. The performance of the entire system is summarized in Table I.

Recent advances in servo techniques and solid state electronics eliminate separate motors and mechanical differentials. One small servo unit assumes their function. The large tubes are replaced by power transistors capable of feeding the capstan motor. Concluding, it should be mentioned that other designs are equally successful with purely electronic control.

Figure 13 shows an additional use of the Pilot-Tone control track system for camera start identification during multiple camera lip-sync production with continuous sound recording. In this version of our scene marking device, the control track will be interrupted for ⅓ sec when camera I is switched on. Camera II will interrupt the control track for ⅔ sec. During transfer of the ¼-in. original to 16mm perforated magnetic film the interruptions to the Pilot-Tone signal are made to actuate a relay. The relay contacts connect a 400-cps tone to a separate head recording a parallel track spaced to one side of the main track. Whenever there is a Pilot-Tone interruption, a 400-cps beep of corresponding length is laid down beside the main track. Both tracks can be heard together on an editing machine or sound reader by moving the reproducing head so it scans both recordings. In normal playback on a standard reproducer, only the main track is scanned and the sync beeps are not heard.

Initially a correction factor to compensate for the different run-up times was determined for each camera with conventional sync sticks. This factor was found to remain constant throughout the production.

Acknowledgment is due to Chester Beachell, Technical Research Dept., National Film Board, who designed the scene marking circuits shown here.

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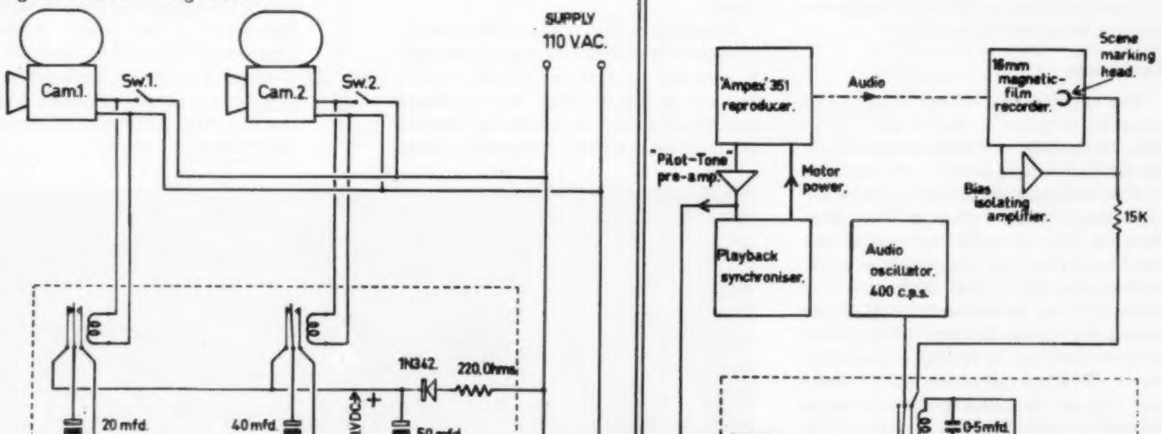
2. Richard H. Ranger, "Sprocketless synchronous magnetic tape recording," *Jour. SMPTE, 54:* 328–336, Mar. 1950.
3. W. D. Fling and D. G. C. Hare, "Picture-synchronous magnetic tape recording," *Jour. SMPTE, 54:* 554–566, May 1950.
4. Walter T. Selsted, "Synchronous recording on ¼-in. magnetic tape," *Jour. SMPTE, 55:* 279–284, Sept. 1950.

Fig. 13. Scene marking device.



Ultrasonic Splicing of Polyethylene Terephthalate Films

By F. P. ALLES

A systematic study covering six variables shown by preliminary tests to be most important in splicing "Cronar" polyester base by the application of ultrasonic energy showed complex interactions. However, a good operating range was found which yielded useful splices, without scraping of the emulsion, with as little as 0.010-in. overlap and splices as strong as the base itself at an overlap of 0.030 in. The splicer designed and used in these studies could handle 8, 16, 35 and 70mm films and hence permitted tests covering a wide range of conditions of use.

Since the development of polyethylene terephthalate film and commercial introduction under the name "Cronar" polyester photographic film base,* there has been a continuing study of methods for splicing this material. Two methods have been described at the Society's Conventions.† In one method a pressure sensitive adhesive tape was used. The other method utilized dielectric heating.

It has been known for some time that ultrasonic energy could be used for joining plastic films and metal foils. However, no information was available on the design parameters or operating conditions affecting the strength or other properties of the bonded material. An experimental splicing unit was designed to determine the effect of six variables on splice strength and evaluate the relative merits of piezoelectric and magnetostrictive ultrasonic transducers.

Equipment

The experimental splicer (Fig. 1) was designed to splice 8, 16, 35 and 70mm film, using either a magnetostrictive or piezoelectric transducer.

The ultrasonic transducer is mounted on a hinged carrier plate *A*. The clearance or gap between the end of the transducer cone and cutter bar, or anvil, is adjustable and may be set by means of screw *C*. The downward force of the transducer tip on the film being spliced is controlled by a spring adjusted by screw *D*. The registration pins, cutters and clamps for holding the film to be spliced are of conventional design. The clamps are mounted on the traveling plate *L* which moves the films under the transducer tip by means of screw *N* driven by motor *M* through a timing belt and sprockets. The desired splicing speed is obtained by changing sprockets. The drive is started by depressing a momentary contact switch (not shown) which jumps the microswitch *O*. When the traveling plate *L* starts, the bar cam *P* releases microswitch *O* to maintain operation of the motor. When the bar cam *P* depresses microswitch *Q* at the end of the splicing cycle a holding relay is activated which reverses the motor and returns the traveling plate to its starting position, at which time microswitch *O* opens the circuit to stop the motor and release the holding relay to reset the circuit for the next splicing cycle. The position of microswitch *Q* is adjustable to set the travel for 8, 16, 35 or 70mm films.

Referring to Fig. 2, one of the films to be spliced is placed over registration pins *E*, clamped between the plates *F* and *G* and cut to length along the righthand edge of the $\frac{1}{8}$-in. wide cutter bar *B* using the knife on the lower righthand clamp. The operation is repeated on the film placed in the corresponding clamps on the right. The resulting overlap of $\frac{1}{8}$-in. is much larger than necessary or desirable. To obtain the overlap desired the film clamps are arranged to be moved laterally by means of cam *I* actuated by lever *J*. The setting of studs K_L and K_R allows adjustment of overlap from 0 to $\frac{1}{8}$-in.

The ultrasonic equipment is shown in Figure 3. The generator for the magnetostrictive transducer is a 25-kc, 100-w unit. The piezoelectric generator is a 40-kc, 50-w unit. The efficiency of the piezoelectric transducer was at least twice that of the magnetostrictive unit so that the ultrasonic energy from both units was approximately the same. There was little or no difference between the strength of splices obtained with these units. The data presented here, however, were obtained using only the piezoelectric unit.

Variables Tested

The variables tested to determine their relationship and effect on the strength of the splice are outlined below and illustrated in Fig. 4.

(1) *Cone Tip Angle:* The angle of the axis of the cylindrical tip to the long dimension of the splice. Angles tested were 90°, 60°, 45° and 30°.

(2) *Overlap:* The length between the edges of the overlapped films. Values of 0.010, 0.020 and 0.030 in. were tested.

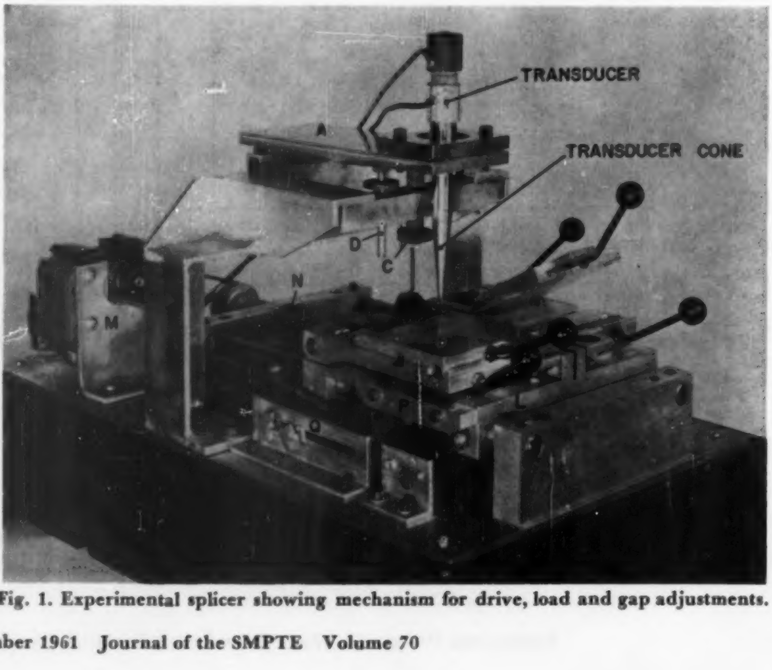


Fig. 1. Experimental splicer showing mechanism for drive, load and gap adjustments.

Presented on October 3, 1961, at the Society's Convention at Lake Placid, N.Y., by F. P. Alles, Photo Products Dept., E. I. du Pont de Nemours & Co., Parlin, N.J.
(This paper was received on September 19, 1961.)

* D. R. White, C. J. Gass, E. Meschter and W. R. Holm, "Polyester photographic film base," *Jour. SMPTE, 64:* 674–678, Dec. 1955.

† V. C. Chambers and W. R. Holm, "A method for splicing motion-picture film," *Jour. SMPTE 64:* 5–8, Jan. 1955; and R. W. Upson, E. Meschter and W. R. Holm, "A method using dielectric heating for splicing motion-picture film," *Jour. SMPTE, 66:* 14–16, Jan. 1957.

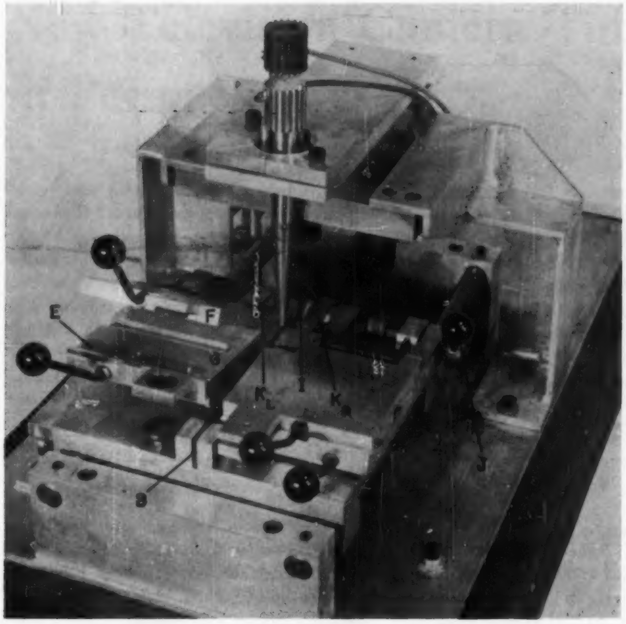


Fig. 2. Details of film clamps, registration pins, and cam for setting overlap.

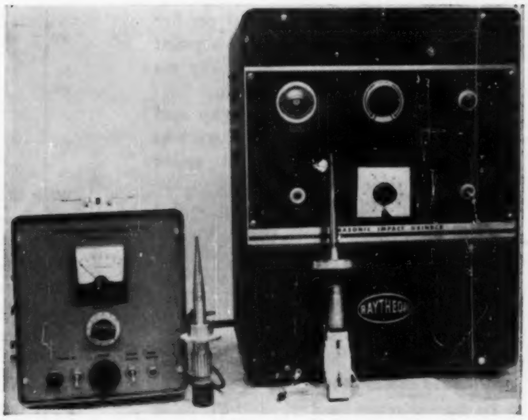


Fig. 3. Piezoelectric (left) and magnetostrictive (right) generators and transducers.

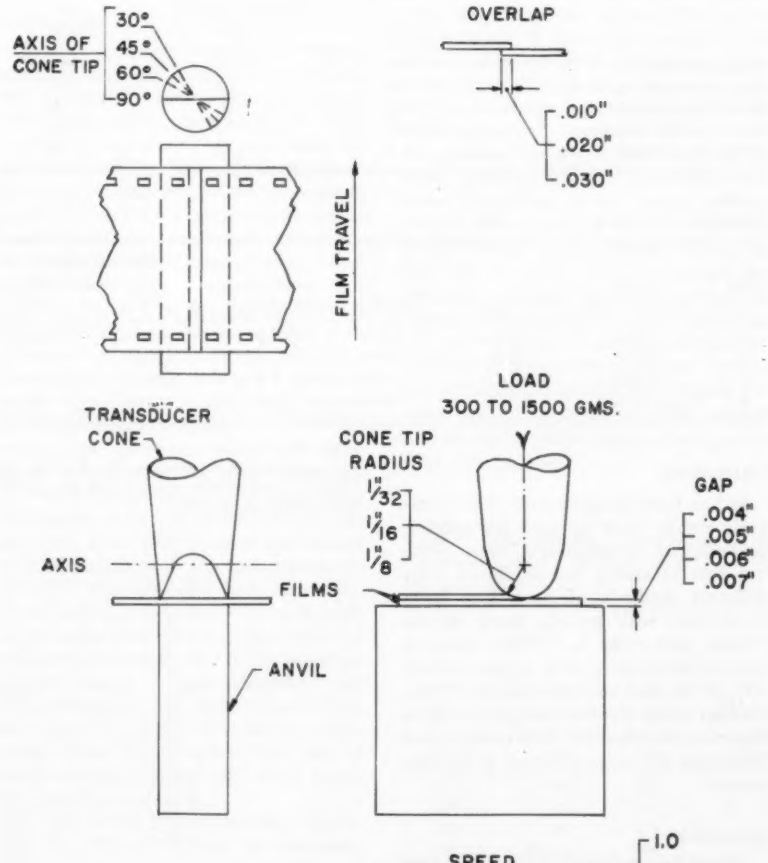


Fig. 4. Schematic of variables tested. (1) Angle of cone tip axis (2) Overlap (3) Cone tip radius (4) Load on transducer (5) Cone to anvil gap (6) Splicing speed.

(3) *Transducer Cone Tip Radius:* This is the radius of the cylindrical contour at the cone tip. Three tip radii were tested: $\frac{1}{32}$-, $\frac{1}{16}$- and $\frac{1}{8}$-in.

(4) *Transducer Cone Pressure:* The load in grams applied to the transducer. The loads tested were in the range 300 to 1500 grams.

(5) *Cone to Anvil Gap:* The gap between the tip of the transducer cone and the cutter bar or anvil. The gap is set with no power into the transducer. Gaps tested were 0.004-, 0.005-, 0.006- and 0.007-in.

(6) *Splicing Speed:* Time in seconds to traverse a 35mm film. Three speeds were selected — 1-, 1.8- and 2.6-sec.

Test Data

The ultrasonic splicer has been used for splicing "Cronar" leader stock and raw and processed films coated on nominal 0.004-in. thick base. Scraping of emulsion or gelatin backing from the films tested was not required before splicing. The data presented on splice strength were obtained on 35mm raw stock, and projection data were obtained on 35mm processed films. The ultrasonic generator was operated at full power for all tests.

The splicer may be used in two ways which have been called "Optimum Gap Method" and "Optimum Load Method."

Optimum Gap Method

In the exploratory phase of the investigation it was found that the cone tip axis was not critical at angles of 60° to 90° but splice strength decreased at angles of less than 60° as shown in Fig. 5. All subsequent tests were made using a 90° angle. Further, it was found that a certain minimum load on the transducer was necessary to obtain a bond, and the minimum load decreased as the cone tip radii decreased. The splice breaking

strength* increased as the load on the transducer was increased up to a point after which there was substantially no further increase in splice strength.

The effects of cone to anvil gap and overlap on splice strength are shown in Fig. 6. It is significant that splice strengths of more than 50 lb/35mm are obtained with a 0.010-in. overlap, and a splice breaking strength equal to the film breaking strength is obtained with a 0.030-in. overlap using the conditions shown. Previous work on splicing indicates that a splice strength of 35 lb/35mm is adequate for projection use.

Optimum Load Method

In the optimum load method the cone tip to anvil gap is adjusted so that with full power into the transducer and no film in the gap the cone tip does not contact the anvil. For 0.004-in. base a clearance of 0.002 in. was used but the same results have been obtained with a 0.0005-in. clearance. The movement of the transducer tip is approximately 0.00025 in. above and below the quiescent state.

The important element in this method was the determination of optimum load on the transducer for maximum splice strength when using fixed values for overlap, power input to the transducer, speed, and cone tip radius.

The optimum conditions for maximum splice breaking strength are shown in Table I.

Projection Tests

Ten-foot loops were made having 20 splices per loop using the "optimum cone to anvil gap" and "optimum load" methods. The results are shown in Table II. No breaks occurred after 270 projections. Projection of samples 1 and 4 was continued for an additional 270 projections with no splice failures. The projections were very quiet due, probably, to the splice thickness of 0.006 in. (coated film thickness 0.0045 in.). In splicing film, using a 0.030-in. overlap, there is some flow of the polymer from the ends of the splice forming soft "ears." These were not removed and caused no splice failures in projection. For some uses film with "ears" may be objectionable in which case they could be removed or possibly a smaller overlap used.

Peel Tests

In the preparation of samples for peel tests the splicer was set up to form a 0.030-in. wide bond between two superimposed films in one clamp, using the two methods described above. Peel strength was determined as shown in Fig. 7. Peel strengths were in the range of 8 to 11 lb/35mm. A peel strength of 4 to 6 lb/35mm is considered to be adequate for use in projectors.

* Determined by ASTM Method D882-49T using a Model TTB Instron Tensile Tester.

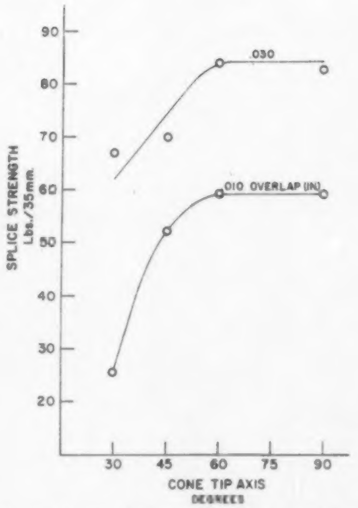


Fig. 5. Effect of angle of cone tip axis on splice strength. Speed 1.8 sec/35mm, load on transducer 1500 gms, cone radius $\frac{1}{16}$ in., cone to anvil gap 0.005 in. Ultimate strength of unspliced film 89 lb/35mm.

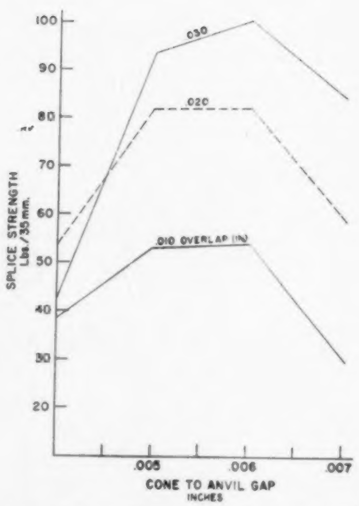


Fig. 6. Effect of cone to anvil gap, and overlap, on splice strength. Speed 2.6 sec/35mm, load on transducer 1000 gms, cone radius $\frac{1}{16}$ in. Ultimate strength of unspliced film 93 lb/35mm.

Table I

	Overlap Inches 0.010	0.020	0.030
Optimum load, g.	600	700	800
Splice strength, lb/35mm	54	62	93
Cone tip radius, in.	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
Cone to anvil gap, in.	0.002	0.002	0.002
Speed, sec/35mm	1.8	1.8	1.8

Table II

Test no.	Cone anvil gap, in.	Overlap, in.	Load, g	Speed, sec/35mm	Splice breaks/ no. projections 270	540
1	0.005	0.010	1000	1.8	none	none
2	0.005	0.030	1000	1.8	none	—
3	0.002	0.010	600	1.8	none	none
4	0.002	0.030	800	1.8	none	—

Conclusions

It has been demonstrated that ultrasonic energy may be used for splicing polyethylene terephthalate films without first removing the emulsion. Two different methods of operations have been used with equally good results. Splices with only a 0.010-in. overlap have a strength equal to approximately 50% of the film strength, and a 0.030-in. overlap yields a splice strength equal to the strength of the film. Peel strength and projection life are considered to be satisfactory.

Discussion

Malcolm Townsley (Bell & Howell Co.): Is there anything that you can say about ultrasonic splicing of "Cronar" to other types of film?

Mr. Alles: The work done on splicing other types of films was not as extensive as that done with "Cronar." Strong splices of triacetate to triacetate have been made when the emulsion was scraped before splicing. In the case of "Cronar" to triacetate strong splices are not obtained using only ultrasonics.

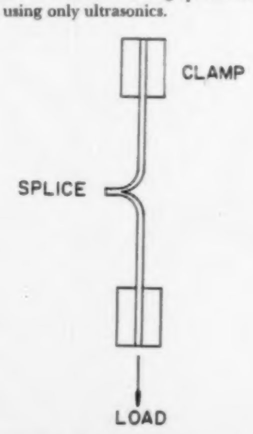


Fig. 7. Schematic diagram of peel strength tester.

New Television Camera Tubes in Perspective

By R. G. NEUHAUSER

Many new television camera tubes, both image orthicons and vidicons, have been introduced into the market in 1960 and 1961. The performance of these tubes is discussed in terms of their suitability for different applications and the conditions under which they must operate. In the image-orthicon line, the trend is toward specialization, with new tubes designed to produce better black-and-white pictures and for new camera designs, or to produce color pictures in black-and-white studio-lighting levels; others were designed for very-low-light-level remote pickups where lighting conditions are extremely adverse. The performance of the new vidicons reflects recent improvements in sensitivity; lower gamma characteristics produce better tonal renditions and low-light sensitivity. In addition, several new types have been introduced for special pickup work for both broadcast and industrial TV uses.

New Image Orthicons

The largest number of changes in the camera-tube field have been in the image-orthicon line. Most of the new image orthicons were developed specifically for television broadcast work. Some of the new designs are also suitable for use in closed-circuit television and other special television applications.

4½-In. Tubes

Image orthicons having a 4½-in. faceplate diameter were re-introduced to the market in the United States in 1960. The 4½-in. image orthicon was originally introduced to the field in 1946 at NBC's New York Studios.[1] It was re-introduced in 1960 in response to the demand for a camera tube which would produce a better picture for magnetic-tape-recorded shows. Higher resolution and signal-to-noise ratio are required for this service, particularly if the production techniques require that successive copies of recordings be made. The 4½-in. camera tubes do produce better signal-to-noise ratio and higher resolution than 3-in. tubes.

The use of 4½-in. tubes had been discontinued late in the 1940's primarily because suitable lenses and zoom lens equipment were not available for this large-size tube. They were re-introduced by English Electric Valve Co. of England in 1958.[2] The 7295 and 7389 are 4½-in. tubes having, respectively, low and high target capacitance. An additional feature of these particular 4½-in. tubes is an image section design which permitted the optical image on the face of these tubes to be the same size as that used on 3-in. tubes. This feature allows the use of readily available lenses and zoom lenses for 4½-in. tube cameras.

In 1960, RCA introduced the 7295-A and the 7389-A. In the "A" versions, the tube geometry is more tightly controlled so that a very narrow range of voltage control can be used to obtain proper electrode operating voltages. Consequently, simplified camera operating procedures and setup controls can be used, and increased stability can be built into the camera operating controls.

Performance of 4½-in. camera tubes is better than that of similarly designed 3-in. tubes in several respects. The higher capacitance of the larger target in the 4½-in. tubes results in a better signal-to-noise ratio. The larger target also provides improved resolution or higher modulation of fine-detail information. In addition, the 4½-in. tubes have somewhat different secondary-electron redistribution effects in the image section. These effects produce the black borders around brightly illuminated objects, as well as the light halos. Although the secondary electrons scattered around the image of the 4½-in. tube travel the same distance as in the 3-in. tube, the relative distance as compared to the basic raster size is somewhat smaller. As a result, the halos and black borders appear smaller on the 4½-in. tube picture than in the 3-in. tube picture.

The 4½-in. image orthicons also use a field mesh design which provides a flatter background in the picture, better corner focus, and more accurate reproduction of brightness transitions, by providing the scanning beam with a strong decelerating field which prevents beam bending and defocus of the dynode surface to produce a picture with a very "flat" background.

The 7295 and 7295-A image orthicons have a medium target mesh spacing of approximately 0.002 in., the same spacing as the familiar 5820. Because of their larger target area, these tubes have a capacitance three times that of the 5820. The 7389 and the 7389-A tubes have a close-spaced target mesh assembly with a spacing of approximately 0.001 in. These tubes have approximately 6 times the target capacitance of the 5820. Table I lists some of the significant characteristics of different image orthicons and shows the improvement obtained in 4½-in. tubes as compared to 3-in. tubes.

Because the 7389-A image orthicon is a very-close-spaced tube, it has a rather abrupt knee characteristic. This tube usually requires camera amplifier circuits which add additional "gamma" correction, or "black-stretch" the signal. The 4½-in. tubes cannot, of course, operate in cameras designed for 3-in. image orthicons.

3-Inch Image Orthicons for Color

The 7513 3-in. image orthicon, which was commercially announced in late 1959 and became widely used in 1960, was primarily designed for use in color cameras. Although the specific objectives

Table I. Comparative Characteristics of New 4½-in. Image Orthicon Tubes. 4½-in. tubes are normally operated with 3 v of the target set up to produce even higher values of signal-to-noise ratio.

Type	Target-mesh spacing, in.	Target-mesh capacitance, μμf	Operating point* (lens stops relative to knee)	Faceplate illumination for operating point, ft-c	Amplitude response at 400 TV Lines, %	Signal-to-noise ratio for 4.5-mc bandwidth†
7295	0.0022	300	(1) +1	0.060	60	55:1
7295-A	0.0022	300	(1) +1	0.060	60	55:1
7389	0.001	600	(1) +½	0.090	60	78:1
7389-A	0.001	600	(1) +½	0.120	60	78:1
3-inch type (for comparison)						
7513	0.0007	300	(1) +1/2 to +1	0.045	50	55:1
			(2) 0	0.030	45	

* (1) indicates black-and-white; (2) color. † Target setup = 2 v.

Presented on May 12, 1961, at the Society's Convention in Toronto by R. G. Neuhauser, Electron Tube Div., Radio Corp. of America, Lancaster, Pa.
(This paper was received on October 16, 1961.)

Table II. Comparative Characteristics of New 3-in. Image-Orthicon Tubes.

Type	Target-mesh spacing, in.	Target-mesh capacitance, $\mu\mu f$	Operating point* (lens stops relative to knee)	Faceplate illumination for operating point, ft-c	Amplitude response at 400 TV lines, %	Signal-to-noise ratio for 4.5-mc bandwidth†
7293	0.0022	100	(1) +1 to +2	0.020	40	32:1
7293-A	0.0018	120	(1) +1 to +2	0.024	40	37:1
5820-A	0.0022	100	(1) +1 to +2	0.020	50	40:1
7513	0.0007	300	(1) +½ to +1	0.045	50	55:1
			(2) 0	0.030	45	
4401 or 4401V1	0.0022	100	(1) +1 to +2	0.014	50	40:1
			(2) 0	0.007	45	
4415 (matched sets)	0.0018	120	(2) 0	0.010	40	35:1
4416	0.0018	120	(2) 0	—	40	35:1
7629	0.010	20	(2) +1	0.002	80	18:1

* (1) indicates black-and-white; (2) color. † Target setup = 2 v.

of this tube design were better registration in color cameras and better uniformity of signal output and background, the tube has also been found useful in high-quality black-and-white studio use. Improved registration is obtained by two features. Precision construction and the absence of magnetic parts in critical portions of the tube produce good static registration. The field-mesh design improves dynamic registration together with other features of performance normally produced by the field-mesh design. Dynamic mis-registration sometimes occurs in color cameras because the image charges on the target are different in one color channel than in the others. In a tube that does not use a field-mesh design, this target-charge differential is sufficient to pull the scanning beam away from its intended trajectory and to enlarge brightly illuminated areas.[3]

An example of such distortion is the red hairline that sometimes appears around a person's face. Because the face is lacking in blue and green light components, the image produced in the blue and green channels is smaller than that in the red channel. As a result, a red line appears between the face and the hair of the person. Because the field-mesh design reduces beam bending to an imperceptible value, it eliminates this problem. It also produces a flatter background signal and more uniform signal output so that color values and brightness values do not change substantially over the entire television field.

The improved corner focus of field-mesh tubes is also a significant feature in color television systems. However, all these improvements in tube geometry and performance cannot be realized unless the tubes are operated in a camera system that incorporates precision deflecting and focusing coils, as well as an improved optical system to improve the corner focus of the optical image. The 7513 requires approximately 25% more light than the 6474 which was previously used in color cameras, because its target capacitance was increased to provide the same signal-to-noise ratio as that of the 6474, which did not have the field-mesh design.

Newer 3-in. image orthicon tubes were developed to permit color pictures to be taken in studios that are equipped to produce lighting levels sufficient for black-and-white television and to permit making color pictures of outdoor sporting events at night.

Substantially less light is available to the image-orthicon tubes in a color camera than in a black-and-white camera. As a result, the light level required to operate a tube in the blue channel of a color camera up to the knee of its transfer characteristic may be as much as 40 times that required to operate the same tube in the same manner in a black-and-white camera. Thus, it becomes imperative that the light be used to best advantage.

The first tubes developed specifically for low light levels were the 7629 and 4401. Table II lists the important characteristics of these and other image orthicons. When the 4401 is used in a color camera, a scene luminance of about 150 ft-L is required with an $f/8$ lens stop. This sensitivity is just about right because this luminance value can be produced in most black-and-white TV studios and the $f/8$ lens stop is sufficient to produce adequate depth of focus. The signal-to-noise ratio of the 4401 tube is about equal to that of the 5820 image orthicon.

The 4401 can be used with somewhat lower lighting levels if the tubes are operated with the highlights about 1 stop below the knee of the light-transfer characteristic. Field tests have shown that operation in this manner is satisfactory and that lighting levels normally produced in outdoor night baseball games and football games are sufficient for such operation of the 4401. If more light is available, the picture becomes better as the light level is increased.

The target capacitance of the 4401 was maintained at 100 $\mu\mu f$ because the level of signal available from this capacitance provides an adequate signal-to-noise ratio for most color programming. The tubes can be operated below the knee if conditions demand, but a good signal-to-noise can be obtained only when proper lighting levels are restored. With reduced target capacitance insufficient signal would be generated for good signal-to-noise ratio regardless of the light levels.

An additional feature of the 4401 image orthicon is a high-gain multiplier which produces a high signal level even when the tube is operated below the knee of the transfer characteristics, and this permits proper operation of the circuits in the color cameras. These tubes are supplied in sets which are matched for high sensitivity in the blue channel, uniformity of background, and uniformity of sensitivity over the television raster. The 4401-V1 is supplied as a single unit for use in black-and-white cameras requiring high sensitivity and high signal output.

The 7629 image orthicon has a high-gain target which approximately doubles the effective photosensitivity of the tube. Its target capacitance is about ⅕ that of the 5820 or the 4401. For reasonably good signal-to-noise ratio, this tube must be operated about 1 stop above the knee. The 7629 in a color camera requires a scene brightness of about 40 ft-L with a lens stop of $f/8$. Under these conditions, the signal-to-noise ratio is approximately 15 or 20 to 1.

The newest tubes in the color-camera line-up are the 4415 and 4416 image orthicons. These types are also designed to permit operation of color cameras in studios equipped only for black-and-white lighting levels. The tubes have an effective sensitivity about 25 to 50% higher than that of the 4401. The 4415 and 4416 use precision construction and field-mesh design similar to that of the 7513 image orthicon, and have similar performance features. The 4416 incorporates a highly blue-sensitive S11 photocathode to provide effective sensitivity of a trio of tubes in a camera substantially higher than that of similar tubes having only the conventional S10 panchromatic response. Because the optical efficiency of the blue channel of a color camera is normally lower than that of the other channels, the sensitivity of the camera is usually limited to the performance that can be obtained in the blue channel. The blue photocathode sensitivity of the 4416 in a color camera is nearly double that of a tube having an S10 photo surface. However, part of this increase of effective sensitivity is offset by the use of a slightly higher capacitance

in the 4415 and 4416 tubes to compensate for the additional noise that results from the field-mesh design.

Black-and-White 3-In.-Diameter Camera Tubes

Five new image orthicons have also been introduced for black-and-white TV studio operations: the 7293, 7293-A, 7611, 4401-VI and 5820-A. The 7293 image orthicon is similar to the 5820 image orthicon, but includes a field mesh. The 7293-A image orthicon has an additional feature in its anti-ghost image section. This design eliminates the highlight ghost effect that often occurs when tubes are operated substantially above the knee, as is normally the practice in black-and-white television systems. A properly adjusted 5820 does not display a ghost characteristic because the voltages and electrode configurations in the image section cause the high-velocity secondary electrons which form the ghost to fall back near their point of origin. When a field mesh is introduced in the tube, however, the required adjustment of electrode voltages causes a ghost image to be produced. In the 7293-A, the design of the image section was changed so that the ghost image is well registered with the primary image when the image-section voltages are adjusted to produce good picture geometry and uniform focus. The performance of the 7293-A in terms of sensitivity and signal-to-noise ratio is approximately equal to that of the 5820.

The 7611 image orthicon is an image orthicon reputed to have long life. Its performance characteristics are very similar to those of the 5820, but its design requires operation of both tubes and camera at elevated temperatures for best performance.

The newest 3-in. image orthicon is the 5820-A. This type features tighter limits on a number of important performance characteristics which determine the picture quality, such as signal-to-noise ratio, background uniformity, highlight signal uniformity, sensitivity, and resolution capabilities.

Vidicons

The most significant improvement in vidicons in the past year has been the development of a vidicon photoconductive surface having higher sensitivity and lower lag. These tubes were developed primarily for industrial television or closed-circuit cameras. The 7735-A vidicon which utilizes this new photoconductor, represents an advance in the art in both sensitivity and reduction in lag characteristics. At present, this tube and others using this new photoconductor are recommended only for closed-circuit and industrial TV systems.

The lag of the 7735 is illustrated by Fig. 1. The signal decays more rapidly than the 7038 broadcast vidicon, but the slightly longer tail on the decay characteristic of the 7735-A makes it less suitable for broadcast use than other types. It is expected that a broadcast version of this tube using the new photoconductor will be developed as soon as more is understood about the nature of the photoconductive material and its processing.

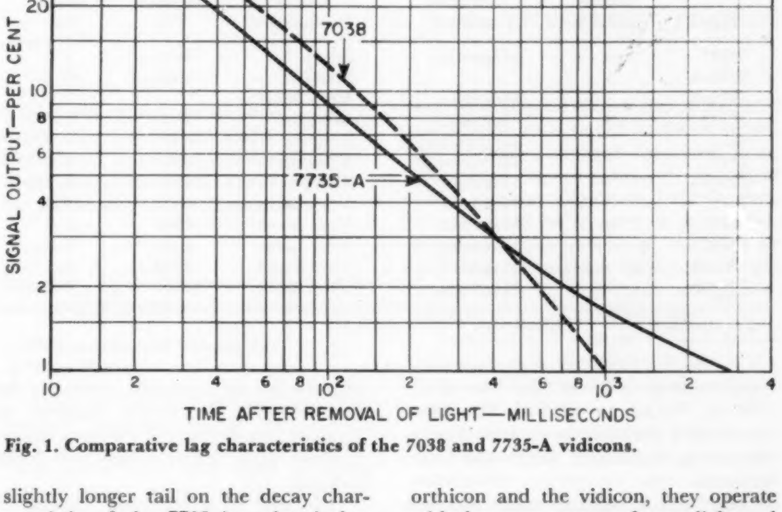


Fig. 1. Comparative lag characteristics of the 7038 and 7735-A vidicons.

The sensitivity of the 7735-A is compared with that of the 7038 in Fig. 2. When operated under the conditions of dark current and highlight illumination represented by the star in Fig. 2, the 7735-A vidicon has sensitivity very close to that of the image orthicon. This point on the curve corresponds to a photoconductive surface sensitivity of approximately 1100 μamp/lm. With this amount of signal current, a vidicon has a signal-to-noise ratio equal to that of the best image orthicon. Because of the difference in image sizes of the image orthicon and the vidicon, they operate with the same amount of scene light and at the same depth of focus of the lenses, and produce signals with approximately equivalent signal-to-noise ratios. (*See Appendix.*)

A vidicon type 7735 was introduced in 1960. It is superseded by the 7735-A. The sensitivity of the 7735 fell midway between the sensitivity of the 7735-A and the 7038. Its lag was longer than either of these types. The 7262-A and 7263-A vidicons are improved versions of the 7262 and 7263 utilizing the new high-sensitivity photoconductive surface. The 7262-A tube is a short-low-heater-power vidicon designed for use in compact transistorized cameras. The 7263-A is a similar tube ruggedized to meet military shock and vibration specifications.

The 7697 is similar in performance to the 7735-A, but its photoconductor is designed so that the operating range of

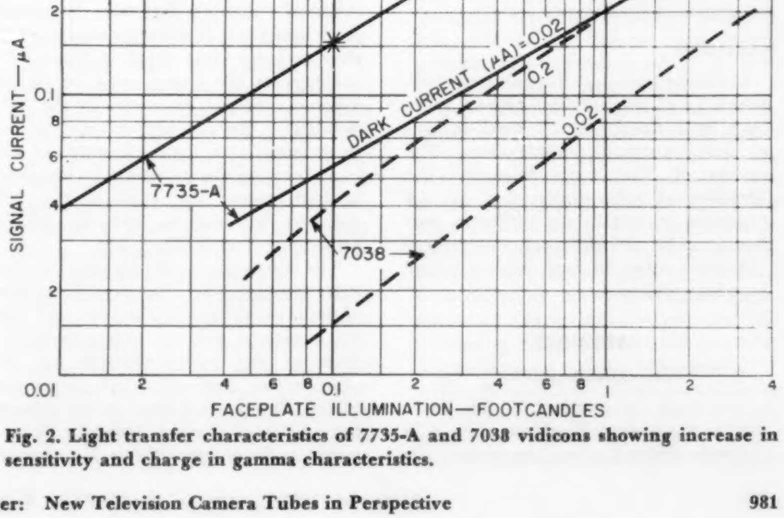


Fig. 2. Light transfer characteristics of 7735-A and 7038 vidicons showing increase in sensitivity and charge in gamma characteristics.

Table III. Comparative Characteristics of New 1-In. Vidicon Tubes.

Type	Completely uniform photo-conductor	Focus and deflection method	Lag or "persistence"	Peak response (A)	Heater power, w
7038*	x	Magnetic	Short	4500	3.8
7038-A			Short	4500	3.8
7735-A	x	Magnetic	Very Short		3.8
7735†	x	Magnetic	Medium	4500	3.8
7522		Electrostatic	Medium	4800	1.0
1343		Electrostatic	Medium	4800	1.0
7291-A	x	Magnetic	Short	4500	3.8/1.0
7351		Magnetic	Very Long	6000	3.8
7697	x	Magnetic	Very Short	4500	3.8
1326		Magnetic	Very Long	6000	3.8
7262-A	x	Magnetic	Very Short	4500	0.6
7263-A	x	Magnetic	Very Short	4500	0.6

* For reference. † Obsolete type.

target voltage is lower than that of the 7735-A, 7262-A or 7263-A. This characteristic is desirable for certain cameras employing automatic target and beam controls.

The 7038-A vidicon, which was also introduced in 1960, is similar in performance to the 7038, but substantially different in structure. The "A" version does not require alignment, and cannot be aligned, because of its magnetically shielded gun structure. This tube is designed to be less susceptible to microphonics by making a substantial portion of this gun structure integral with the wall of the tube.

The 7291-A vidicon is a modification of the 7291 vidicon designed for film-pickup work. Its performance is similar to that of the 7291, but its construction is identical to that of the 7038-A.

An electrostatically deflected and focused tube, type 7522, was also introduced in 1960. This tube employs a deflection system called a "Deflectron."[5] The 7522 is specifically designed to operate in transistorized or lightweight cameras in which the circuits and components required for magnetic deflection and focusing would be too heavy or too bulky. It has a resolution capability of about 500 lines and requires deflecting voltages of about 30 v per plate.

Conclusion

It can be seen that the different characteristics of the different camera tubes have been developed for good reasons to satisfy particular applications. The variety of tube types illustrates the flexibility of tube design that can be employed to obtain the optimum performance for the different requirement of camera tubes for both industrial and broadcast television.

APPENDIX

Effective Sensitivity

The term "sensitivity" as frequently used is a loosely defined quantity. It is uniquely defined when the sensitivities of two tubes are compared in terms of the relative scene brightness required to produce pictures having the same signal-to-noise ratios, angles of view and depth of focus.

The user of a television camera or camera tube is interested in a quantity which defines how much light must be used on a scene to produce a satisfactory picture, or how much more or less light can be used with a different type of camera tube to produce a comparable picture. The light-transfer characteristics of a camera tube do not provide this information directly. First, the proper operating point of the highlights of the scene must be determined. For the image orthicon, this point is usually close to the "knee." For the vidicon, the signal should be at least 0.1 μamp. From this information, the highlight illumination level on the face of the camera tubes can be determined from the light transfer characteristic.

An additional factor to be considered is image size and depth of field. The image size in the vidicon is 0.5 by 0.375 in.; that of the image orthicon is 1.28 by 0.96 in. If the same aperture size of the lens is used for the two tubes, the depth of focus is the same for lenses having the same angle view. Therefore, when tubes of different sizes are compared using lenses that produce the same field of view and the same depth of focus, "f" numbers at the lenses must be set at different values. The ratio of the "f" numbers is directly proportional to the image sizes, as is the focal length of the lens, because the aperture is identical in both cases. The ratio of the "f" numbers for vidicon and the image orthicon is $(1.28/0.50) = 2.56$.

The difference in illumination on the tube faceplates is the inverse square of the ratio of the "f" numbers, or 0.153 for a vidicon and an image orthicon. That is, the image orthicon has an illumination level of 0.153 times the vidicon illumination level, or the vidicon has 6.53 times as much highlight illumination as the image orthicon. If the image orthicon requires an illumination of 0.01 ft-c and the vidicon requires 0.1 ft-c to produce a comparable picture, the lens factors reduce this ratio from 10 to 1, to 1.53 to 1. On this basis, then, the vidicon and image orthicon have nearly equal "effective sensitivity."

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Discussion

Anon: Are the vidicon tubes 7038 and 7735 interchangeable?

Mr. Neuhauser: There is no basic difference between the two; except for the photoconductor performance they are completely interchangeable.

John Miklosik (Canadian Broadcasting Corp.): There was a time when the figure of 35 to 1 was considered to be a minimum acceptable signal-to-noise ratio; now I see your posted figure of 30 to 1 as being the present norm. If 35 to 1 was considered to be the minimum, what explanation is there for retreating from this figure and what improvements may be expected?

Mr. Neuhauser: I think I understand what you mean. You see, with a given amount of light into the television camera tube it's difficult to obtain something for nothing, in other words, a higher signal-to-noise ratio. With higher capacitance tubes, however, and more light input it is easy to obtain a higher signal-to-noise ratio. We are continually trying to push the tubes with a given target mesh spacing or target capacitance to the point where they will have a higher signal-to-noise ratio. But I think we've gone pretty far along that line at the present time.

Mr. Miklosik: The lesser of many other evils, in that case.

Mr. Neuhauser: It's not the lesser of two evils, if you consider that you can improve the situation with a higher capacitance tube and somewhat more light.

Mr. Miklosik: My understanding was that 35 to 1 was considered to be the bottom limit; anything of a lesser ratio than that would be very much inferior.

Mr. Neuhauser: Well, at about 35 to 1 the eye becomes very critical of noise — it seems to be the break point — I would agree with you on this. It's a very difficult question to answer: "Can you expect anything greater?" I think there will be small advances in signal-to-noise ratio for a given amount of light in the scene or on the tube but not large advances. We're getting very close to the theoretical limits for an image orthicon.

Alvin Siegler (CBS-TV): Is there any relationship between operating point and amplitude response?

Mr. Neuhauser: There is some difference. Amplitude response generally increases about 20% at 400 lines if you operate at two stops over the knee. This is not a drastic increase, particularly at the 400-line point, which is above the cutoff of the television hand.

Information for Authors of SMPTE Papers

By BERNARD D. PLAKUN

The author's task in preparing a full technical paper for publication and a shortened version for oral presentation is outlined in step-by-step detail. The form is that of an actual technical paper. Although the procedures outlined are those used specifically by the SMPTE, some of the suggestions offered will apply in general to all technical articles intended for publication or oral presentation.

1. Introduction

To achieve its overall scientific purpose, the Society conducts meetings and publishes a *Journal* for the presentation of technical papers. Many other scientific organizations provide similar programs, but there are certain features which set this Society's efforts apart.

This Society is unusual in its encouragment of the use of motion pictures and other visual aids in presenting papers. At its conventions, it provides well-planned projection facilities and offers them freely to those who would use them.

By presenting two major conventions in each year, rather than the more usual annual event, the Society keeps subject matter timely in a fast moving technical area.

The *Journal* relies on papers which have been presented at conventions for a large part of its technical content. Processing of papers can be quite rapid. When schedules have been faithfully followed, and the subject matter has warranted early publication, papers have been published in the month following their oral presentation.

These, and other, features characterize the Society's convention and publication efforts. Closely tied to these features are the Society's editorial procedures. They are, of necessity, the ones found to be simplest and most effective in this setting. These procedures are here presented, in the hope that they will be of value to both veteran authors and those who are looking forward to their initial appearance before the Society.

A special word is in order for those who, not having presented a paper before, perhaps do not think of themselves as authors at all. There must be many who have interesting stories of their work to relate to their associates. Stories about work on original ideas, or which present new findings, or which put old findings in a new light, may be good subject matter for papers presentation. All who participate in the Motion-Picture, Television and allied fields are therefore urged to read this material carefully, in the hope that they will be encouraged to make their work known.

A contribution submitted on April 19, 1961, by Bernard D. Plakun, Barnes Engineering Co., Stamford, Conn.

2. Origination and Submission of Your Paper

Announcements of forthcoming convention programs appear within each issue of the *Journal*, and on the inside back cover. They give dates, locations and other information which the author needs for planning his participation.

The author should consider the location of the convention, and its accessibility to him. In general, though, he should choose the earliest convention which his preparation schedule will allow him to meet. Many companies recognize the importance of representation, and encourage their members who qualify as authors to appear at conventions, regardless of location, by accepting the cost incident to attendance.

The dates of the conventions, and the preparation steps preceding them, vary somewhat from year to year. Exact dates are stated in advance of each convention, as the program takes shape. Approximate dates, sufficiently accurate for preliminary planning, are given below:

	Spring Convention	*Fall Convention*
Submit Title and Abstract . . .	February 14	July 15
Submit Manuscript . .	April 1	September 1
Appear at Convention. . . .	May 1	October 1

Having decided to present a paper, the author takes his initial step to change the thought into reality by submitting an Author's Form. These forms can be obtained on request from the Papers Committee members named in the *Journal*. The form is, in effect, an application to reserve time on the program. It is required, without exception, as a necessary condition for presentation of a paper at a convention.

An abstract of the proposed paper is to be submitted with the Author's Form. Also required is a statement as to whether the paper has been published elsewhere, or has been "promised" in any way to another recipient. Although these conditions are to be avoided, there can be mitigating circumstances which may permit presentation and subsequent publication of a paper so encumbered. For example, a paper may have been committed to a company periodical which receives only internal distribution. There would be no need to reject such a paper. Upon review of the abstract and the information furnished in the Author's Form, and upon acceptance, the author is notified accordingly.

Acceptance of a paper for convention presentation is the responsibility of the Program Chairman but it does not imply automatic publication in the *Journal*. As will be explained later, in fuller detail, all manuscripts require an additional subsequent review by the Board of Editors, and must pass this review before being accepted for publication. As a matter of experience, however, it can be stated that a major portion of the papers presented at conventions has been published.

Furthermore, presentation of a paper at a convention is not a condition for publication. True, most published papers have been so presented. However, any author who wishes to forego the advantage of convention presentation may submit his paper directly to the Editor for publication in the *Journal*. The paper should be complete (that is, not just an abstract or a description of an idea to be developed), and should be accompanied by a statement regarding encumbrances, similar to that called for by the Author's Form. Any paper so received will be reviewed by the Board of Editors and, if accepted, will be published.

3. The Men Who Will Be Concerned With Your Convention Paper

While your paper grows from an idea, and takes shape as something to be presented from the speaker's platform, you will be in contact with many persons who are interested in it. You should know who these persons are.

The Editorial Vice-President is responsible for the content and publication of the *Journal*. Assisting him in the discharge of this responsibility are several committees. One of these, the Papers Committee, is concerned with obtaining papers and providing program content for conventions. The Editorial Vice-President and the Papers Committee Chairman serve concurrently for a two-year term, which is the period of four semiannual national conventions.

The Papers Committee is composed of a General Chairman (or, simply, Chairman) and a group of Regional Chairmen. There are currently 11 Regional

The chairman: advisor, director, coordinator and liaison.

Chairmen representing as many different geographic areas in the United States; and National Regional Chairmen from Canada and several other countries in the Western Hemisphere, Europe, Africa, Asia and Australia. All men are chosen for their knowledge of the editorial activities of the Society. They serve the committee in a broad advisory capacity and can offer assistance to prospective authors in their areas. In addition four of these men are slated to serve as Program Chairmen for a National Convention during their two-year term of office.

Let us follow the transition from Regional Chairman to Program Chairman. The Regional Chairman for the area containing a convention site serves as the Program Chairman for the convention held there. His service as Program Chairman is, however, limited to the period of the convention. As Program Chairman, he has primary responsibility for obtaining papers and assembling a program for the particular convention to be held in the area where he resides.

Topic Chairmen

Since each convention embraces several different topic areas, the Program Chairman enlists the assistance of a group of Topic Chairmen, each of whom gathers a group of papers in his assigned field, and organizes them into one or more coherent program sessions. The Program Chairman directs the efforts of the Topic Chairmen, seeks out the special program events which have come to distinguish the differently located conventions, and arranges the sessions and special events into a unified whole.

One of the Topic Chairmen will be responsible for making arrangements for you, the author, to present your paper. The announcements in the Journal will name these men and their assigned topic areas, so that you will know the appropriate Topic Chairman with whom you will work. Since the Topic Chairmen are chosen from among the active, technically competent men in their fields, you may find that you recognize the chairman for your own topic as a friend or acquaintance. If, as sometimes happens, you cannot decide which topic fits your paper, you may submit your Author's Form to the Program Chairman.

Session Officials

The Advance Program is published in the Journal about a month before the meeting. Papers are arranged in the approximate order in which they will be given but do not yet have the scheduled times listed. As the date approaches for you to present your paper, possibly one week before the convention opens, you will receive an advance copy of the Final Program. Your paper will be listed in relation to the other papers in the program, the assigned time will be shown, and the Session Chairmen will be named. This information will probably have reached you earlier by letter from the Program Chairman.

A Papers Desk system was inaugurated at the 1961 Fall Convention to provide a focal point for all authors to which to bring the slides or films to accompany their papers and at which to exchange information with Chairmen of their Session. The author's complimentary daily registration badge is also to be available for him at this desk. The author will also pick up his slides or films from the Papers Desk after delivering his paper.

You will find that the session officials are men of high professional stature who can command the respect and attention of an audience, and who are concerned with the production of a smooth-running session. These men have the responsibility for presenting each author in the best possible setting and, in this way, giving the audience a good return for their attendance effort.

4. Content Faults and Virtues

Papers should be informative and well organized. Results of actual experience and research should be given, rather than unsubstantiated statements and sales talk. Good English is, of course, a prerequisite, and proper terminology should be used.

Fringe Subjects

It is the general objective of the *Journal* to record the progress of the art, in motion-picture and television engineering, and in extensions of these arts to instrumentation and high-speed photography. In order for this to be effective, it is necessary to include consideration of fields that are marginal to that of engineering. These marginal fields may outline new directions for the growth of the art. They may deal with the economics or the social and political implications of the motion-picture and television and allied arts; the broader aspects of technology and management in these arts; and similar wide areas of occasional timeliness and interest to the well-rounded reader.

Controversial papers are, of course, welcome. It is clear, however, that the paper must be informative, and that the author is expected to substantiate his position with engineering data and explanation.

It is obvious that the *Journal* has only finite capabilities and budget. To avoid unduly diluting its efforts, it can allot only a moderate amount of space to subjects in marginal and controversial fields. Contributions to these fringe areas can in general be only occasional, and must be factual, especially well written and suitably terse.

Commercialism

Although commercialism is not proper in a technical paper and constitutes cause for rejection, it is sometimes difficult to define the boundary between proper product description and undue commercialism. This boundary is usually determined by both the author's sense of ethics and the Society's review of material submitted. Authors should exclude selling prices and other such proprietary information regarding their equipment as would be proper only in the market place.

Brevity

Clarity is the ideal in all scientific writing, and brevity is an effective way to attain clarity. A simple sentence is easy to understand. A compound sentence, even though grammatically correct, may not be. Graphs and tables can often convey in a small space information that

would require many paragraphs of text. Remember that the simpler and clearer you make your discussion, the wider will be the audience that you reach in the membership of the Society.

Jargon

Jargon without supporting explanation is not proper in a technical paper. The language peculiar to the growth of new developments in science is considered as jargon until it has been accepted as part of the world's uniform technical vocabulary. The reason for the existence of jargon is understandable. Galileo and Copernicus must have struggled with the inadequate vocabulary of the literary language of their time in much the same way as do today's authors. They did, however, define such new words as were necessary for exposition of their new ideas and so passed them on as proper technical language. The danger today is that different workers may recognize an identical new concept under different conditions, and label it by different names.

The Society objects to the use of jargon without an accompanying explanation on the following grounds:

(*1*) *Jargon* is transient.

(*2*) *Jargon* is usually highly specialized, understanding being limited to a few people.

(*3*) *Jargon* is confusing to readers in other countries who are not familiar with English idioms, and who may be quite remote from our local philosophies.

If an author feels he must write with current jargon for acceptance among his professional associates, he should at least submit a glossary, defining his jargon terminology in conventional terms for those readers who are not as familiar with the particular subject as is the author.

Beyond the Boundary

Consideration may be given to specific characteristics of papers which might warrant exclusion. These may come in several categories:

(*1*) *The paper* is distinctly outside the field of motion-picture and television engineering (and the extensions of these arts to instrumentation and high-speed photography), and also of the marginal fields discussed above. Examples of this might be papers dealing, say, with electronic computers, or atomic physics.

(*2*) *The paper* deals exclusively with applications, with no novel motion-picture or television or allied techniques. For example, pick-up problems of television remotes, or natural hardships in the wilds in taking a nature study film, or direct applications of high-speed photography, cinephotogrammetry, or closed-circuit or industrial television may involve no new techniques in these arts, the novelty being concentrated in the subject matter or use rather than in advancement of the process.

(*3*) *The paper* describes equipment or processes with no discussion of performance, or with claims of performance not substantiated by descriptions of tests or sufficient explanation. Examples of such "sales talks" are descriptions of motion-picture mechanisms with extravagant claims, or proposed film treatments without engineering descriptions of tests to support their value, or television equipments with alleged wonderful properties which are not suitably substantiated. Often, in this particular category, a short description can be given in the "New Products" column.

It is recognized that exceptions do occur, and that some openness of mind is necessary. The Society will continue to consider unusual and special situations, to prevent the *Journal* from being frozen into too rigid a pattern, and at the same time to maintain its high editorial standards.

5. The Elements of a Complete Paper

The number of technical articles published in each year is so great that even the most diligent reader must confine his attention to a small portion of the output. In deference to the reader in this plight, the author must fashion his material into a fairly uniform shape. The structure to be used is as outlined and defined below.

A complete paper will contain the following elements, in the order of their listing.

- Title
- By-line
- Abstract
- Body, including:
  - Introduction
  - Summary
  - Development
  - Figures and tables
  - Conclusions
  - Acknowledgment (if needed)
- References and/or Bibliography (if needed)
- Appendixes (if needed)
- Glossary (if needed)

The *title* should be as short as is consistent with clarity. Trade names should preferably not be used in the title.

The *by-line* should identify the author or authors, and the institution or company claiming management interest in the work described. If there is more than one author, each should identify his own company if different from that of the others. Titles are not included in the by-line. In manuscript copy only, the by-line should show the date of release of the information.

The *abstract* of a paper is a very important portion of it. Authors do not always realize that it is often the only portion which many prospective readers will see, and do not give enough attention to its preparation. To be most effective it should give the essential introduction and conclusions of the paper. The published abstract can be modeled upon but need not duplicate the abstract in the convention program.

Abstracts are on occasion published in international reviews. In order to expedite the work of such journals, UNESCO has published a "Guide for the Preparation and Publication of Synopses" (or Abstracts), and a copy of this guide is attached as an appendix. The recommendations included in this document are those which the Society accepts as desirable for a good abstract.

The *body* of the paper develops the main argument, and presents supporting data. It should not contain subordinate proofs or similar elements which break into the orderly sequence by which the main argument is developed. Instead, such subordinate material may be presented in an appendix.

The *introduction* relates the main argument about to be developed to the reader's knowledge of what has been done.

The *summary* states the objective, the method of approach, results, and major conclusions in more complete form than the abstract.

The *development* uses *figures and tables* to supplement the text. Just as brevity is a virtue in text, so is economy a virtue in figure and tabular material. Photographs taken from viewpoints only slightly different can usually be combined into one. Captions are used with all figures and tables, and should be composed carefully to harmonize with the text. If the text refers to parts A, B, C and D, the illustrations should call out these parts by the same letters. The general notion involved is "Coherence of Content."

Conclusions are brief restatements, compactly assembled, of the key points developed in the body of the paper. They should not introduce new ideas.

Brevity is an effective way to obtain clarity.

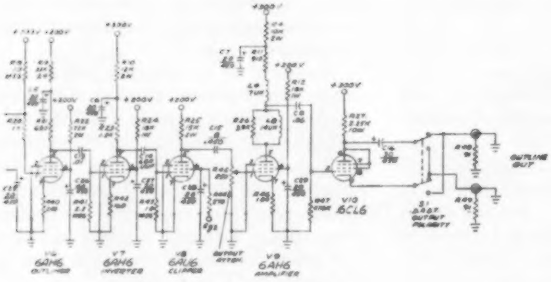


Figure X

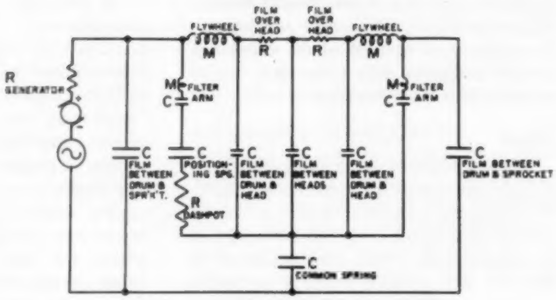


Figure Y

Acknowledgments give credit to those persons, institutions or companies who have rendered valuable assistance at the author's request, but who have not shared the primary responsibility for initiating, conducting and presenting the work described. A statement of acknowledgments is not mandatory on the author.

References enable a reader to locate literature cited as support for statements made in the text, and also can serve to place the author's contribution into its proper perspective with respect to the current state of the art. A *bibliography* is a list of articles, books or other published material from which the reader may gain more information than the published article, by itself, can offer.

Appendixes provide detailed proofs where required to support points made in the text. They allow the main argument to proceed by the shortest route, leaving the detours to be explored later.

A *glossary* assists the reader in understanding new terms and interpreting jargon.

6. Mechanics of Preparation

Preparing the Manuscript: It is anticipated that most of the papers will be published in the *Journal*. For this purpose, the manuscript should be typed double-spaced, with margins of about one inch, on one side of regular white letter size (8½ by 11-inch) paper. Good multilith or mimeograph copies are satisfactory, but blueprints and copies made by some types of office machines are questionable. If the copies are typed, one of those submitted should be the original, complete with original illustrations.

Title and Abstracts: At any time prior to publication of the paper, you are free to refine your title and improve your abstract. Because of the importance of this portion of the paper to both you and your audience, you are invited to review it at each typing against the following check list:

- Can wording be condensed or clarified?
- Is the subject coverage defined?
- Is there a statement of findings or conclusions?
- The abstract should be concise and without superfluous phrases such as, "This paper describes......"

Illustrations: Photographs and charts should be suitably prepared to ensure good reproduction. Photographs should be 8 by 10-inch glossy prints but should not contain detail which will not be readable when the 10-inch dimension is reduced by photo-engraving to 4 or 4½ inches. Curves or sketches should be original drawings in India ink on 8½ by 11-inch (inclusive of margins) white paper or tracing cloth. Curves on conventional graph paper will not reproduce satisfactorily, but tracings in which only the principal cross-section lines are used are usually satisfactory. Letters and figures should be 0.140 inch high (not less than 0.120 inch) — these are standard Leroy and Wrico sizes — on 7 by 10-in. curves or sketches. A list of captions for all illustrations should be supplied. Owing to the cost of making photo-engravings, authors are asked not to submit more than one illustration for every two pages of typewritten manuscript except in cases where additional illustrations are deemed essential.

Typing Form: Appropriate subheadings for various sections of the paper usually make it more readable. See typical papers in the *Journal* for the usual form, and the manner of listing numbered references at the end of the paper. General references may be listed under "Bibliography" separately from specific references. The accepted order of items in the reference is: author, title, periodical name, volume, pages (first and last), month, year.

7. Reading Your Paper

Oral Presentation at Convention: For most effective presentation at the Convention, authors are encouraged to prepare a special version of their papers for oral delivery. Generally, this should be a shortened version, describing briefly the problem, the approach, procedures and equipment, and citing the salient findings and conclusions. Detailed descriptions and tables, or other lengthy material which may be appropriate and essential for the published version, generally should be eliminated or condensed and shown as a slide in order to sustain interest in the oral presentation. This will also allow more time for questions and discussion from the floor.

The shortened version is usually prepared after the full paper has been written. The preferred length is about 5 to 10 pages, double spaced. It should follow as simple an outline as possible. *Why work was started, how it was done* and *what was accomplished* may be sufficient.

The SMPTE is not the only scientific organization to advocate preparation of a shortened version of a technical paper for oral presentation. The IRE, for example, has published at least two separate recommendations to this effect.[1,2]

The burden of holding the session to its planned schedule rests with the session chairmen. Each session is timed to allow presentation of all papers scheduled, plus a few minutes of discussion following each paper. If the schedule falls behind, authors appearing late in the session will be at a disadvantage. The session officials will therefore use all means at their disposal to hold each author to his alloted schedule. They will expect each author to cooperate fully with their efforts.

One of the session officials will act as a moderater during the discussion period following presentation of your paper. You can assist at this time. Any person addressing a question to you from the floor should identify himself, but is apt to forget to do so. Should this happen, the session official is obliged to break in. However, your reminder to the questioner can serve the same purpose without drawing attention away from you.

Preparation of Slides and Visual Materials: Facilities will be available at the Convention for projecting either of two sizes of lantern slides — 3¼ by 4-inch and 2 by 2-inch. The 3¼ by 4-inch slides usually give clearer and brighter pictures on the screen. However, they are more of a problem where color is to be shown, and here 2 by 2-inch slides are more convenient for the author. Usually the oral presentation will be made more interesting and effective by showing more views than would be proper for the published version. Good close-up views of the equipment details should be included.

The use of color slides is strongly recommended. Even tables and graphs

in color, such as yellow or white on dark blue, gain better attention. The convenience of taking color pictures with 35-mm cameras makes it relatively easy to prepare 2 by 2-inch color slides. However, the illustrations submitted for publication should be black-and-white unless color is very specially needed to demonstrate the point being made.

The most common fault of visual presentation is the effort to put too much information on one slide. Comparing the two drawings in Figs. X and Y will remind you of papers you have heard. Even Figure Y is not ideal but should be considered as having minimum size lettering. Authors seeking information on optimum size of lettering may consult American Standard Z38.7.19-1950, "Dimensions for Lantern Slides," which will be supplied gratis by Society Headquarters, upon request.

Labeling Slides

Another common fault is projection of slides upside down or reversed. This is due entirely to slides having been improperly labeled, and can be prevented by correct marking to conform to the standard procedure which the operator will follow during presentation. To prepare the slide, orient it to read properly to you, and then paste the thumb dot in the lower left corner, with the number upside down, as shown in the illustration. In projecting the slide so that the projection will be right side up, the operator will place this dot in the upper right hand corner of the slide carrier as he faces the screen. This will make the number appear erect. The correct position of the slide can be verified in the dark, as the dot must fall under the ball of the right thumb. You may find it helpful to draw a diagonal line across the edge of the stack of slides, as shown in the illustration, after you have arranged them in the right order and position. Do this with a brush pen and straight edge. Any unintended rearrangement will then show up as a break in the line.

It is desirable to show 35mm or 16mm demonstration films, when appropriate, but they should be cut to the minimum length required. The different sections of such films should be titled, if possible, to clarify the presentation. Of eonrse, motion pictures cannot appear in the published paper. However, the reader can be informed of what was presented by a brief description noting the point that was demonstrated. Stills cut from the film can be published.

If there is anything special or critical about the presentation of slides or motion pictures, preliminary rehearsals should be arranged with the session chairman and the projectionist. Occasionally, special projection or demonstration techniques will lend themselves to a particular subject. Included are multiple projectors (slide or motion picture) for side-by-side comparison or contrast, and many of the newer transparency projectors handling up to 10 by 10-inch fields serving much more effectively than blackboards. Projection equipment for several commonly used 2 by 2-inch magazines (Airequipt, Eastman, etc.) can be made available with remote control from the lectern if you will let the Program Chairman know ahead of time. "Opaque" projectors are generally not suitable for use due to the low light and poor image quality. The Program Chairman and the various convention committees will do their best to provide the special equipment you desire, if they are given reasonable notice.

8. Acceptance for Publication

Each paper submitted for publication in the *Journal* is reviewed by the Board of Editors. In order that the particular reviewer may feel free in giving his advice, identity is kept confidential. On occasion, according to the nature of the paper and possible conflicting reactions it may evoke, papers are sent to several reviewers. The advice from all reviewers is weighed.

The decision in regard to publication is made by the Chairman of the Board of Editors and, in special instances, by the Editorial Vice-President. The Editor advises the author by letter of this decision.

Revisions are sometimes requested as a condition for publication. When a paper is unsatisfactory it is usually true, nevertheless, that the author has given much thought to the problem and has something of value to contribute. In such cases, the author is advised what useful portion of the material can be salvaged, and particularly what can be done without requiring too large a further expenditure of effort by the author. This forms a much more satisfactory disposition than outright rejection of the paper, or a request for complete rewriting.

Some papers described equipment with very little engineering information. Such papers, if sufficiently brief, are regarded as suitable candidates for byline articles in the news section of the *Journal*.

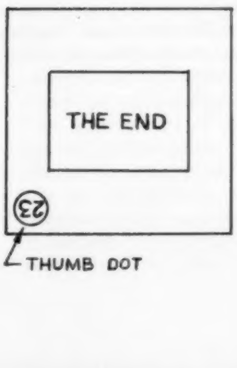
9. Printer's Proofs

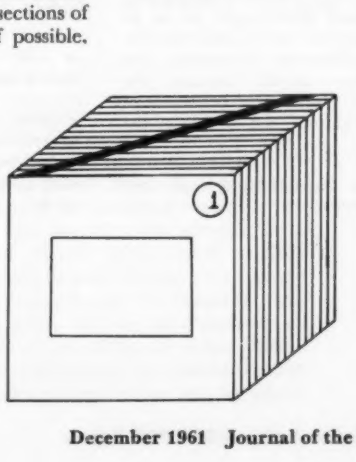
Shortly after your paper has been accepted for publication it will be set in type for printing. Proofs will be forwarded to you for review. You should know what to look for during this review.

The printer sends galley proofs direet to the author who returns them to the editor at Society headquarters. The galley proofs are made up on long strips of paper, with text and illustrations on separate sheets. The proofs can be be changed if necessary as a result of your review; however, changes should be kept to an absolute minimum for the sake of economy.

Such text changes as are absolutely necessary are best made in accordance with instructions which accompany the proofs. Standard signs for correcting proofs can also be found in at least one convenient source.[3] However, since you are not expected to be a master of the art of proofreading, your plain English instructions in the margin will be sufficient.

Though it may be disputed, the decision of the Board of Editors is final.





In your review, you need not concern yourself with mechanical errors of typesetting. The printer will proofread the galleys against your manuscript, and can be relied on to detect the more obvious errors. However, he must rely on you to catch technical mistakes and errors in sense. The lines of a table heading or figure caption may have been separated unwisely, or an error of statement which may have escaped you in typewritten copy may cry loudly for redress when you see it in print. These are the errors which you are best equipped to detect.

Text changes cost money, and should therefore be held to a minimum. Costs are proportional to the number of lines that must be reset. If a line can be revised without changing its length, no other lines need be reset and the cost is relatively minor. If the length changes, all the following lines to the end of the paragraph must be reset.

With the proofs, you will receive an invitation to order reprints at low cost. The low cost is possible because printing is done from the same type as is used to print the *Journal*. If you wish to order reprints, you should do so as soon as possible.

10. Conclusions

Preparation of a technical paper requires a great deal of organized effort. Each of the several steps involved takes place in an orderly sequence. A knowledge of what is required, and why, can aid the author in the performance of his task. The Society trusts that the author will find himself amply rewarded for his efforts by knowing that he has contributed to the pool of scientific literature in his chosen field.

11. Acknowledgments

The author is grateful for assistance received from his colleagues on the Papers Committee and the Board of Editors. Herbert E. Farmer, C. Loren Graham, Pierre Mertz, Garland C. Misener and Rodger J. Ross have helped to shape the content. Glenn E. Matthews, who has devoted many years of service to the Society, not only set down the framework for these procedures in 1931, but has also helped in shaping the present version.

References

1. Arthur C. Downes, "Proper presentation of papers before technical meetings," *Proc. IRE, 35:* 235, Mar. 1947.
2. William J. Temple, "Preparing the oral version of a technical paper," *Proc. IRE, 36*: 388–389, Mar. 1948.
3. *Webster's New Collegiate Dictionary*, G. & C. Merriam Co., Springfield, Mass., Appendix titled "Preparation of Copy for the Press."
4. William Strunk, Jr., and E. B. White, *The Elements of Style*, The Macmillan Co., New York, 1959.

APPENDIX

Guide for the Preparation and Publication of Synopses*

1. "Synopsis" is a term adopted by the Royal Society of London (in fulfillment of a recommendation of the Scientific Information Conference sponsored by the Society in 1948) and by the UNESCO International Conference on Science Abstracting, 1949, to describe an author's summary of a scientific paper which is published simultaneously with the paper itself after editorial scrutiny by the editor of the Journal in which it is published.

2. The purpose of a synopsis is not only to convenience the readers of the Journal in which it is published, but also to reduce the cost and to expedite the work of the abstracting Journals, and thus to contribute to the general improvement of informational services in the scientific field.

3. The synopsis should comprise a brief and factual summary of the contents and conclusions of the paper, a pointer to any new information which it may contain, and an indication of its relevance. It should enable the busy reader to decide more surely than he can from the mere title of the paper whether it merits his reading it.

4. The author of every paper is consequently requested to provide also a synopsis of it, in accordance with the following suggestions.

Style of Writing

5. Use complete sentences rather than a mere list of headings. Any reference to the author of the article should be in the third person. Standard rather than proprietary terms should be used. Unnecessary contractions should be avoided. It should be presumed that the reader has some knowledge of the subject but has not read the paper. The synopsis should therefore be intelligible in itself without reference to the paper. (For example, it should not cite sections or illustrations by their numerical references in the text.)

Content

6. As the title of the paper is usually read as part of the synopsis, the opening sentence should be framed accordingly so as to avoid repetition of the title. If, however, the title is not sufficiently indicative, the opening sentence should indicate the subjects covered. Usually, the beginning of a synopsis should state the objects of the investigation.

7. It is sometimes valuable to indicate the treatment of the subject by words such as: brief, exhaustive, theoretical, etc.

8. The synopsis should indicate newly observed facts, conclusions of an experiment or argument, and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc.

9. It should contain the names of any new compound, mineral species, etc., and any numerical data, such as physical constants; if this is not possible, it should draw attention to them. It is important to refer to new items and observations, even though some may be incidental to the main purpose of the paper; such information may otherwise be hidden although in fact it might be very useful.

10. When giving experimental results the synopsis should indicate the methods used; for new methods the basic principle, range of operation and degree of accuracy should be given.

References, Citations

11. If it is necessary to refer in the synopsis to earlier work, the reference should always be given in the same form as in the paper; otherwise, references should be omitted.

12. Citations to scientific Journals should be made in conformity with the standard practice of the Journal for which the paper is written. (The International Conference on Science Abstracting has recommended the standard proposed by the International Organization for Standardization, Technical Committee 46, names of Journals being abbreviated as in the *World List of Scientific Periodicals*.)

Length

13. The synopsis should be as concise as possible. It should only in exceptional cases exceed 200 words, so as — among other things — to permit it, when printed, to be cut and mounted on a 3 by 5 inch card.

Publication – Language and Format

14. The International Conference on Science Abstracting has recommended that synopses be published in one of the more widely used languages, no matter what the original language of the paper, in order to facilitate its international usefulness.

15. The International Conference on Science Abstracting also commended the practice of certain Journals in which all the synopses appearing in a single issue are printed together either inside the cover or with advertisements on the back in such a way that they can be cut out and mounted on index cards for reference without multilating the pages of the Journal itself. For this purpose the synopses should be not more than about 4 inches wide so as to be mounted on 3 by 5-inch cards.

* United Nations Educational, Scientific and Cultural Organization.

Errata

September 1961

"A Method of Producing Telecine Test Materials of Specified Density," by Leslie H. Holmes, pp. 699–701

On p. 701, col. 3, line 5 of *Author's Note* (following References)
For: CBS; *Read:* CBC

November 1961

"SMPTE Elections," p. 920, col. 3

Line 27 (line 2 under *CANADIAN*):
For: Secretary-Treasurer, John Burman
Read: Secretary-Treasurer, Harold Hundert

Line 55 (line 1 of *ROCHESTER*):
For: Chairman, Walter R. Weller
Read: Chairman, William R. Weller

Last line (*ROCHESTER*):
For: Managers . . .Robert E. Hobkins
Read: Managers . . .Robert E. Hopkins

standards and recommended practices

Proposed SMPTE Recommended Practice RP 7

The Proposed SMPTE Recommended Practice RP 7, Density and Contrast Range of Black-and-White Films and Slides for Television, was first published for trial in January 1960. Receiving several adverse comments questioning the choice of density values and method of measurement, the proposal was returned to the subcommittee and, after many meetings and much deliberation, the points in question were clarified and the modifications written into this present draft. The fourth draft has now been accepted by both the Television and Standards Committees and is again published for a three-month period of trial. All comments should be sent to Alex E. Alden, Staff Engineer, prior to March 15, 1962. If no adverse comments are received, the proposal will then be submitted to the Society's Board of Governors for approval as an SMPTE Recommended Practice.—*A.E.A.*

Proposed American Standards

The proposals published here have been approved by the Engineering and Standards Committees and are presented now for a three-month period of trial and comment. Please address your comments to Alex E. Alden at Society Headquarters prior to March 15, 1962. If no adverse criticism is received by that date, these proposals will be submitted to ASA Sectional Committee PH22 for further processing.

Three of these proposed standards, PH22.134, 8mm Magnetic Reproduce Characteristic; PH22.135, Magnetic Sound Record on 8mm Motion-Picture Film Perforated 1R-1500; and PH22.136, 8mm Magnetic Striping of 16mm Motion-Picture Film Perforated 8mm 2R–1500, supplement the first four 8mm magnetic sound standards published in the October 1961 *SMPTE Journal*. The Sound Committee, anticipating the rapid growth of 8mm magnetic-sound developments, is working diligently to provide the necessary standards for the industrial use of 8mm products.

The Proposed American Standard PH22.107, Film Spools for 8mm Motion-Picture Cameras, 25-ft Size, has had a long and tedious history. This proposal, initiated in 1954, was first published in the January 1956 *SMPTE Journal* and again in June of 1959, bringing many adverse comments. The major difficulty in arriving at an agreement reflected the problem of finding a spool that would physically fit all existing 8mm cameras. The committee now feels certain that a spool made in accordance with this standard will fit known cameras of American manufacturers. A second proposed standard is being prepared for 50- and 100-ft size camera spools. The committee was in accord that combining this additional ininformation with the present completed document would again curtail the acceptance of the highly necessary standard.—*A.E.A.*

PROPOSED SMPTE RECOMMENDED PRACTICE RP 7

Density and Contrast Range of Black-and-White Films and Slides for Television

Introduction

This Recommended Practice originated in the Subcommittee on Density Requirements for TV Films and Slides of the Television Committee. The purpose of the recommendation is to promote uniform, high, technical quality of television programs on films and slides from any source by specifying density values which are most desirable for effective television transmission. The achievement of optimum picture reproduction requires not only proper print quality and density but also the cooperation of the artist, production directors and technicians in matters such as make-up, composition, lighting, and exposure of negative as well as proper adjustment of the television system. It has been the experience of the members of the committee that any attempt to correct for shortcomings in one step by introducing nonstandard techniques in another, will usually result disadvantageously.

Films conforming to this Recommended Practice are intended to provide optimum quality when reproduced through a television system. However, they may not necessarily appear to be optimum when viewed by direct projection.

Recommendations

1. *Scope*

1.1 This recommendation specifies important density values of black-and-white 16mm and 35mm motion-picture films and slides intended for television transmission.

2. *Density Requirements*

2.1 The minimum diffuse density of highlight areas shall have a normal value of 0.4 to 0.3 but not less than 0.3 for optimum reproduction in the television system. This value is not intended to apply to glint, specular highlights or other small areas where details need not be reproduced.

2.2 The maximum diffuse density of lowlight areas shall have a normal value of 1.9 to 2.0 but not greater than 2.0 for optimum reproduction in the television system. This value is not intended to apply to small areas where details need not be reproduced.

2.3 The density of human faces, usually observed more intently than other picture areas, shall be greater than the measured minimum density as specified in Section 2.1 by a value not less than 0.15 or more than 0.5 unless special effects are desired. These density values are important in order to preserve the proper density relationships between face tones and high-lights.

3. *Measurement*

3.1 The method of density measurement shall be in accordance with American Standard Method of Determining Transmission Density of Motion-Picture Films, PH22.27-1960, or the latest revision thereof approved by the American Standards Association, Incorporated.

3.2 Evaluation of the film under normal conditions of television reproduction by means of an oscilloscope calibrated in terms of diffuse density may be used as an alternative method of measuring film density. The oscilloscope used shall be in accordance with the Institute of Radio Engineers Standard Measurement of Luminance Signal Levels, 58 IRE 23.S1, or the latest revision thereof.

NOTES

1. The following Society-sponsored American Standards apply to the dimensional values for films and slides for television:

(a) Picture Area—Motion-Picture Film. The television picture area of 35mm and 16mm motion-picture film shall be in accordance with American Standard Television Picture Area—35mm Motion-Picture Film, PH22.95-1954, and Television Picture Area—16mm Motion-Picture Film, PH22.96-1954, or the latest revisions thereof approved by the American Standards Association, Incorporated.

(b) Soundtrack. The photographic sound record on 35mm and 16mm motion-picture prints shall be in accordance with American Standard Photographic Sound Record on 35mm Prints, PH22.40-1957, and Photographic Sound Record on 16mm Prints, PH22.41-1957, or the latest revisions thereof approved by the American Standards Association, Incorporated.

(c) Film Dimensions. The film width, perforations, etc., shall be in conformance with American Standards or SMPTE Recommended Practices.*

(d) Television Slides. The dimensions of slides to be used for television transmission shall be in accordance with American Standard Slides and Opaques for Television Film Camera Chains, PH22.94-1954, or the latest revision thereof approved by the American Standards Association, Incorporated.

* A complete Standards Index is available from Society Headquarters.

Proposed American Standard

8mm Magnetic Sound Reproduce Characteristic

PH22.134

1. Scope

This standard specifies the reproduce characteristic for magnetic sound records on 8mm motion-picture film.

2. Sound Record

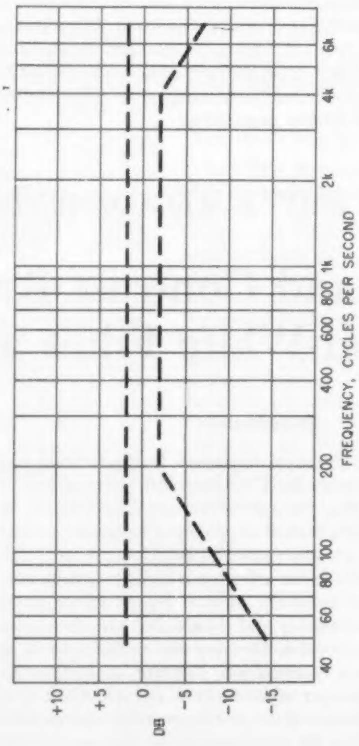
The test film used for determining the magnetic sound reproduce characteristic shall be in accordance with Proposed American Standard 8mm Multifrequency Test Film, Magnetic Type, Perforated 1R-1500, PH22.-131.

3. Mean Film Speed

In reproducing, the test film shall pass through the equipment at a rate of 24 perforations per second (approximately 18 ft per minute) with a mean film speed tolerance of ±0.5 percent.

4. Frequency Response

The electrical output of the system, when using the test film referred to in 2 and measured across a correctly matched impedance termination, shall be within the limits specified in the figure.



NOT APPROVED

Proposed American Standard

Magnetic Sound Record on 8mm Motion-Picture Film, Perforated 1R-1500

PH22.135

1. Scope

1.1 This standard specifies the lateral location and dimensions of the magnetic sound record on 8mm motion-picture film.

1.2 This standard specifies the picture-sound separation of 8mm motion-picture film with a magnetic sound record and a 0.030-in. nominal width magnetic coating.

2. Picture-Sound Separation

The magnetic sound record on the film shall precede the center of the corresponding picture by a distance of 56 ± 1 frame.

3. Magnetic Coating

3.1 With the direction of film travel as shown in the diagram, the magnetic coating shall be on the upper face of the film.

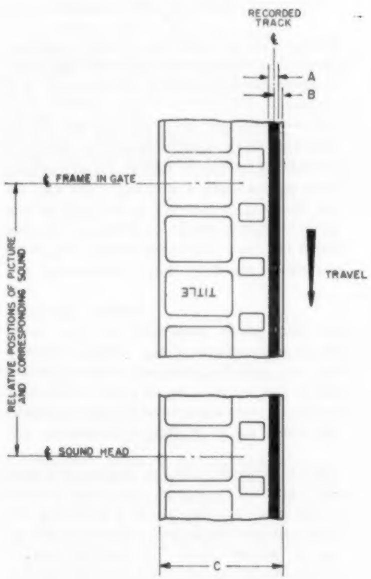
3.2 The magnetic coating shall be as specified in American Standard Magnetic Coating of 8mm Motion-Picture Film, PH22.88-1956.

4. Dimensions

The dimensions shall be as specified in the diagram and table.

5. Revision of American Standard Referred to in This Document

When the following American Standard referred to in this document is superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply: American Standard Magnetic Coating of 8mm Motion-Picture Film, PH22.88-1956.



Dimensions	Inches	Millimeters
A*	0.019 min	0.48 min
B	0.015 ± 0.001	0.38 ± 0.03
C	0.314 nom	7.98 nom

* This dimension is for tracks produced in equipment using the same head for recording and reproducing. In commercially produced prints intended for use on a variety of reproducers, it is recommended that a recording head be used capable of producing a 0.025-in. min width track having the same centerline.

NOT APPROVED

Proposed American Standard

Magnetic Striping of 16mm Motion-Picture Film, Perforated 8mm, 2R-1500

PH22.136

1. Scope

This standard specifies the location and dimensions of the magnetic striping material applied to 16mm motion-picture film with two rows of 8mm perforations.

2. Magnetic Coating

2.1 The location and dimensions of the magnetic coating shall be as specified in the diagram and table.

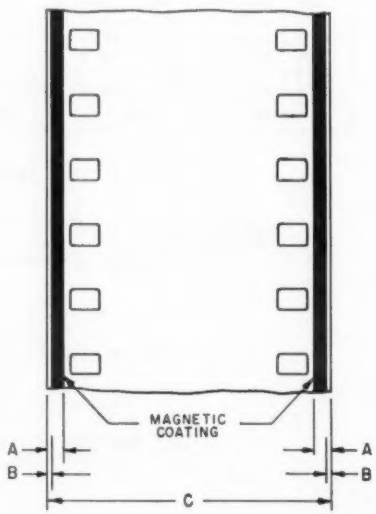
2.2 The magnetic strips are on the side of the film away from projector or camera lens.

3. Film Stock

The film stock used shall be of the low-shrinkage safety type, cut and perforated in accordance with American Standard Dimensions for 8mm Motion-Picture Film, PH22.17-1954.

4. Revision of American Standard Referred to in This Document

When the following American Standard referred to in this document is superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply: American Standard Dimensions or 8mm Motion-Picture Film, PH22.17-1954.



Dimensions	Inches	Millimeters
A	0.031 max 0.028 min	0.79 max 0.71 min
B	0.000 + 0.005 − 0.000	0.00 + 0.13 − 0.00
C	0.628 nom	15.95 nom

NOT APPROVED

Proposed American Standard

Film Spools for 8mm Motion-Picture Cameras, 25-ft Size

PH22.107

1. Scope

1.1 The dimensions shown in this standard are for 8mm motion-picture film spools with a nominal capacity of 25 ft. These spools are used in cameras of the type in which each roll of film is passed through the camera twice for exposure in accordance with American Standard 8mm Motion-Picture Film, Usage in Camera, PH22.21-1953. The spindle holes in the spool are shown with splines which are intended to assist in assuring correct orientation of the spool in the camera.

1.2 This standard does not specify the relative orientation of the splines in the two spindle holes (or of the core slot).

2. Operation in Camera

2.1 When the spool is on the supply spindle, the flange with the 3-splined spindle hole, flange A (Fig. 1), shall be on the left-hand side (as seen from the lens).

2.2 The half of the film adjacent to the flange with the 3-splined hole, when the spool is on the supply spindle, shall be in line with the camera lens.

2.3 When the spool is on the take-up spindle, the flange with the 4-splined spindle hole, flange B (Fig. 3), shall be on the lefthand side (as seen from the lens).

2.4 When the loaded camera is viewed from the side, with the lens to the left, both the supply and take-up spools shall rotate in a clockwise direction.

3. Dimensions

3.1 The dimensions shall be as given in the diagrams and table.

3.2 If rivet heads or other fastening devices extend beyond the outer surface of the flange, they shall lie within the zone indicated by diameters K and L (Fig. 3). It is not intended that this standard prescribe the nature or number of these fastening devices.

3.3 Dimension H_1 (Fig. 2) is the space between the flanges outside the core. It is measured from a point on the inner surface of one flange to the corresponding point on the opposite flange. The measurement shall be made with an instrument which does not distort the flanges.

3.4 Dimension H_2 (Fig. 2) is the space between the flanges inside the core. This space shall be sufficient to permit maximum width film of 0.630 in. (16.00mm) to fit freely into the film slot. The space between the inner surfaces of the splines, within a diameter of 0.384 in. (9.75mm) (D min), (Figs. 1,3), shall not be less than 0.622 in. (15.80mm).

3.5 Dimension J_1 (Fig. 4) is the overall thickness of the spool within a 0.615-in. (15.62mm) diameter zone at the center of each flange.

3.6 When the spool is rotated on an accurate, tight-fitting spindle, the maximum outward deviation from the *intended plane of rotation* for any point on the flange outside the 0.615-in. (15.62mm) diameter zone shall not exceed 0.015 in. (0.38mm). This 0.015-in. (0.38mm) tolerance includes fastening devices, variations in flange thickness, flatness and lateral runout of the flanges.

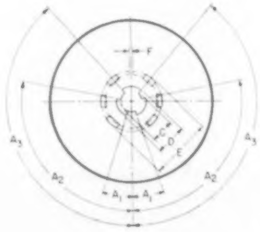


Fig. 1

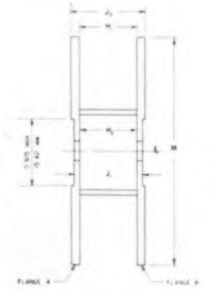


Fig. 2

Fig. 3

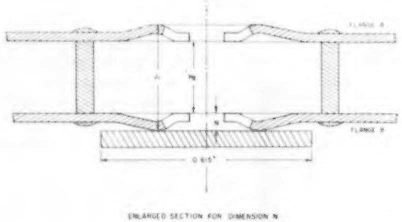


Fig. 4

Dimensions	Degrees
A_1	$19^1/_4 \pm 1$
A_2	$100^3/_4 \pm 1$
A_3	$139^1/_4 \pm 1$
B_1	$19^1/_4 \pm 1$
B_2	$70^3/_4 \pm 1$
B_3	$109^1/_4 \pm 1$
B_4	$160^3/_4 \pm 1$

Dimensions	Inches	Millimeters
C (bore for spindle)	$0.288 + 0.007$ $- 0.004$	$7.32 + 0.18$ $- 0.10$
D	0.384 min	9.75 min
E (core diameter)	0.750 ± 0.015	19.05 ± 0.38
F	0.035 ± 0.020	0.89 ± 0.51
H_1 (see 3.3)	0.631 min	16.03 min
H_2 (see 3.4)	0.622 min	15.80 min
J_1 (see 3.5)	0.720 ± 0.020	18.29 ± 0.51
J_2 (see 3.7)	0.760 max	19.30 max
K (see 3.2)	0.615 min	15.62 min
L (see 3.2)	0.812 max	20.62 max
M	2.031 ± 0.015	51.59 ± 0.38
N (see 3.9)	0.038 min	0.97 min
N_1 (see App. D)	0.025 min	0.64 min

The *intended plane of rotation* is defined as a plane perpendicular to the axis of the spindle and coincident with the surface of a flat support centered on the spindle axis and having a diameter of 0.395 in. (10.03mm).

3.7 Dimension J_2 is the overall thickness of the spool *outside* the 0.615-in. (15.62mm) zone which is centered on each flange. J_2 is a composite dimension covering all of the spool characteristics described in 3.6.

3.8 Dimension F (Fig. 1) specifies the width of slot in the core for attaching the end of the film.

3.9 Dimension N (Fig. 4) is the effective thickness of the 4-splined webs which engage most camera drivers. It is measured from a plane perpendicular to the axis of the spindle and coincident with the surface of a flat support having a diameter of 0.615 in. (15.62mm).

4. Revision of American Standard Referred to in This Document

4.1 When the following American Standard referred to in this document is superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply: American Standard 8mm Motion Picture Film, Usage in Camera, PH22.21-1953.

APPENDIXES

(These Appendixes are not a part of Proposed American Standard Film Spools for 8mm Motion-Picture Cameras, 25-ft Size, PH22.107, but are included to facilitate its use.)

Appendix A

Since the maximum value of H_1 (Fig. 2) does not affect the interchangeability of the spool, no limit is specified. However, the maximum is an important quality characteristic and it is expected that every spool manufacturer will hold H_1 within the narrowest limits that his design and manufacturing process permits.

Appendix B

The angular dimensions and tolerances for the width of the tongues in the splined spindle holes are in accord with current practice for new spools and with the requirements of existing cameras. However, there are in existence and use spools of older design with tongues slightly wider by 1° to 2° on each edge of each tongue.

Appendix C

Camera spindles should allow for a radius of not more than 0.015 in. (0.38mm) at each corner of each tongue.

Appendix D

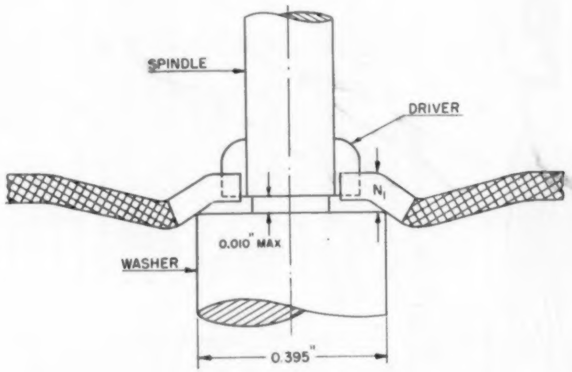
For a number of years, the effective thickness of the 4-splined webs which engage most camera drivers (Dimension N, Fig. 4) was the stock thickness, nominally 0.040 in. (1.02mm). Recently, spools have been made from thinner materials which require embossing to maintain Dimension J_1 (Fig. 4) and to enable the splines to engage the camera drivers, some of which have a clearance approaching 0.025 in. (0.64mm).

As outlined in 3.9, Dimension N (Fig. 4) is normally measured to a flat support having a diameter of 0.615 in. (15.62mm). Many cameras have spool support washers with diameters considerably less than 0.615 in. (15.62mm). In order to assure proper operation with such cameras, the dimension from the inside of the 4-splined flange to the plane of a flat support 0.395 in. (10.03mm) in diameter centered on the flange (Dimension N_1, Fig. 5) shall be at least 0.025 in. (0.64mm).

The enlarged section for Dimension N (Fig. 4) illustrates one method of shaping the splines in the 4-splined flange so they will engage the camera driving spindle when the flange thickness is less than 0.025 in. (0.64mm).

Camera spindles engaging the 4-splined flange of the spool should not have a gap greater than 0.010 in. (0.25mm) between the bottom of the spindle driving spline and the top of the spindle shoulder or washer that supports the spool.

It is recommended that, in newly designed cameras, the diameter of the supporting spindle shoulder or washer be not less than 0.500 in. (12.70mm) and no greater than 0.615 in. (15.62mm).



SPINDLE AND SPOOL RELATIONSHIPS

Fig. 5

news and reports

91st Convention and Equipment Exhibit

April 29 to May 4, 1962—Ambassador Hotel, Los Angeles
Theme: Advances in Color Motion Pictures and Color Television

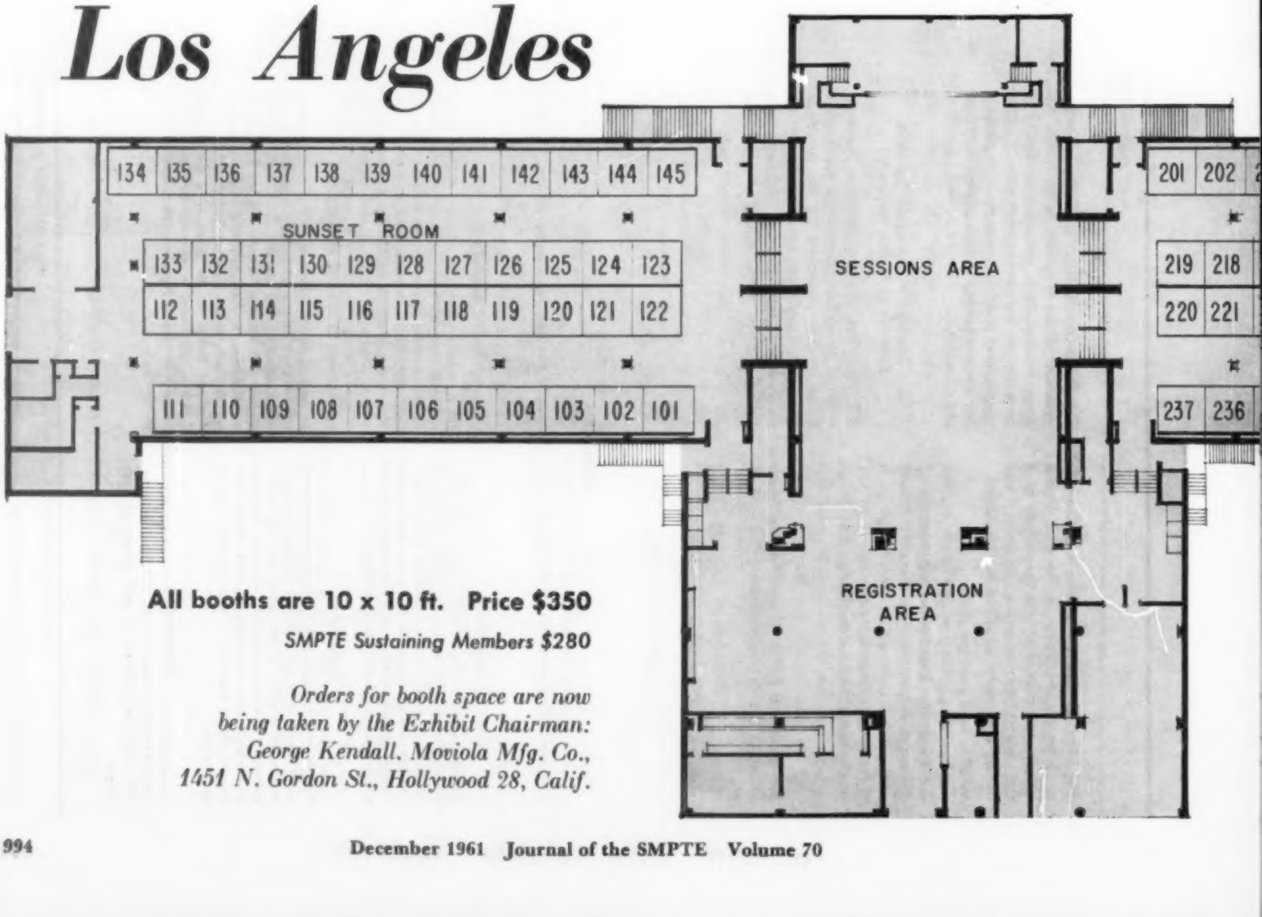
Technical Program

Everyone concerned with organizing the technical program is determined on this occasion to be firmly dictatorial about the deadlines for accepting papers. In spite of efforts in the past, there have been far too many papers submitted late for previous conventions, resulting in drastic schedule revisions and many disappointed contributors. This time, the Program Chairman intends to be ruthless in his observance of the deadline dates. All those who are planning to present a paper at the 91st Convention must see to it that their abstract is in the Program Chairman's hands by FEBRUARY 12. Reading copies of manuscripts must be in by March 26.

The Program Chairman — **Edward P. Ancona, Jr.,** 3170 Lake Hollywood Drive, Hollywood 28 — reports some interesting developments so far. Since color is the general theme, every topic included in the program will have at least one paper on the subject. Three papers that will certainly be of importance for many people are a report on new developments in thermoplastic recording from General Electric, a paper on electron beam recording from Eastman Kodak, and a description of recent advances in kinescope recording from RCA. An outstanding tutorial paper on color is planned for a special evening session, to accompany another tutorial paper on sensitometry.

Tentative plans are for no less than four sessions of instrumentation and high-speed photography papers, three of which will be concurrent with other topics. The nonconcurrent session will include papers of general interest to engineers in other fields.

Los Angeles



All booths are 10 x 10 ft. Price $350

SMPTE Sustaining Members $280

Orders for booth space are now being taken by the Exhibit Chairman: George Kendall, Moviola Mfg. Co., 1451 N. Gordon St., Hollywood 28, Calif.

Papers from abroad, of which there have been an increasing number at recent conventions, are being coordinated by **De J. White,** Magnasync Corp., 5546 Satsuma Ave., North Hollywood, as Associate Program Chairman for International Papers. The short film subjects for the technical program are being collected by **Ted Fogelman,** Consolidated Film Industries, 959 N. Seward St., Hollywood 38.

Equipment Exhibit

A big display of the latest developments in professional television and motion-picture equipment is in the making. This will be one of the main features of the 91st Convention and a primary attraction to visitors from all parts of the industry. The wide range of the SMPTE's terms of reference is reflected in the variety of equipment seen at SMPTE shows, where specialists of any type of professional motion-picture or television activity find their particular interest well represented and at the same time have an opportunity of catching up with developments in related areas of the industry. SMPTE shows are unique in this respect.

The following listing of displays already being planned for the Ambassador indicates that variety will indeed be the spice of the Equipment Exhibit, with something of interest for everyone:

Ampex Corp. — *Videotape recorders and TV cameras*
Animation Equipment Corp. — *Animation stands and cameras*
Arriflex Corp. of America — *Cameras and accessories*
Bach Auricon, Inc. — *Cameras and accessories*
Bell & Howell Co. — *Printers and laboratory equipment*
Birns & Sawyer Cine Equipment, Inc. — *Motion-picture studio equipment*
Camera Equipment Co. — *Motion-picture studio equipment*
Compco Corp. — *Reels and cans*
Florman & Babb, Inc. — *Motion-picture studio equipment*
Gordon Enterprises — *Instrumentation and high-speed photography cameras and accessories*
Karl Heitz, Inc. — *Cameras, lenses and accessories*
Hi-Speed Equipment, Inc. — *Film processors*
Hollywood Film Co. — *Editing and laboratory equipment*
Houston Fearless Div. — *Film processors*
L-W Photo Products, Inc. — *Analysis projector and laboratory equipment*
Lipsner-Smith Corp. — *Supersonic film cleaner*
Magnasync Corp. — *Sound recording equipment*
Mole-Richardson Co. — *Lighting and special effects*
Neumade Products, Inc. — *Motion-picture editing and studio equipment*
Photo-Sonics, Inc. — *Instrumentation and high-speed photography cameras and accessories*
Precision Laboratories Div. — *Film editing equipment*
Prestoseal Mfg. Corp. — *Film editing equipment*
Producers Service Co. — *Printers and studio equipment*
Quick-Set, Inc. — *Tripods*
S.O.S. Photo-Cine-Optics, Inc. — *Motion-picture studio equipment*
Stereotronics, Inc. — *Stereoscopic industrial TV equipment*
Traid Corp. — *Instrumentation and high-speed photography cameras and accessories*
Westrex Co. — *Sound recording equipment*

Opening after lunch on Monday, the Exhibit will run from Monday through Thursday of the Convention week. In addition, there will be a private Preview on Monday morning for

members of the Association of Cinema Laboratories and their employees who will be holding a meeting at the Ambassador concurrently with the Convention.

On Wednesday of Convention week there will be a special session at which exhibitors will demonstrate or describe some of their new products to registrants.

As the list above shows, orders are now being taken for space. Companies who plan to be there but who have not yet reserved their booths should contact the Exhibit Chairman without delay; he is: **George Kendall,** c/o Moviola Mfg. Co., 1451 N. Gordon St., Hollywood 28. Order forms and a brochure with detailed information can also be obtained from SMPTE Headquarters.

Local Arrangements

Convention Vice-President **Harry Teitelbaum** had his corps of Local Arrangements Chairmen lined up well in advance for the 91st Convention. In fact a few of them were already listed in the October *Journal*. Here now is a complete listing of the people who are tackling the hours and hours of work required behind the scenes to pin down the details of a big Los Angeles convention.

Local Arrangements Chairman: **Ralph E. Lovell,** 2554 Prosser Ave., Los Angeles 64.

Local Arrangements Vice-Chairman: **Jack P. Kiel,** Photo-Sonics, Inc., 820 S. Mariposa St., Burbank.

Equipment Exhibit: **George Kendall,** c/o Moviola Mfg. Co., 1451 N. Gordon St., Hollywood 28.

Hotel Arrangements: **De J. White,** Magnasync Corp., 5546 Satsuma Ave., North Hollywood.

Hospitality: **Theodore B. Grenier,** American Broadcasting Co., 4151 Prospect Ave., Hollywood 28.; assisted by **Beverly Angel.**

Membership: **Harry Lehman,** Cine-Tel, 6327 Santa Monica Blvd., Hollywood 28.

Luncheon: **G. Carleton Hunt,** General Film Laboratories, 1546 N. Argyle Ave., Hollywood 28.

Banquet: **Walter J. Farley, Jr.,** W. J. German, Inc., 6677 Santa Monica Blvd., Hollywood 38; assisted by **Dennis F. Godfrey.**

Registration: **Arthur Jacobs,** The Jack Wrather Org., 270 N. Canon Dr., Beverly Hills; assisted by **Robert Creamer,** General Film Laboratories, 1546 N. Argyle Ave., Hollywood 28.

Projection: **Merle H. Chamberlin,** M-G-M Studios, Culver City.

Closed-Circuit Television: **Glenn Aikens,** American Broadcasting Co., 4151 Prospect Ave., Hollywood 28.

Public Address and Recording: **Daniel Wiegand,** USC Dept. of Cinema, University Park, Los Angeles 7; assisted by **Ken Miura.**

Publicity: **Thornton Sargent,** Equitable Bldg., Hollywood & Vine Sts., Hollywood 28.

Transportation: **Russ Landers,** General Film Laboratories, 1546 N. Argyle Ave., Hollywood 28.

Ladies Program: **Mrs. Ralph E. Lovell,** 2554 Prosser Ave., Los Angeles 64; and **Mrs. Harry Teitelbaum,** 1015 Summit Dr., Beverly Hills.

Motion Pictures of the Convention: **Herbert E. Farmer,** USC Dept. of Cinema, University Park, Los Angeles 7.

Auditors: **A. B. Johnson,** Pathe Laboratories, 6823 Santa Monica Blvd., Hollywood 38; and **Jim Hanley,** Consolidated Film Industries, 959 N. Seward St., Hollywood 38.

90th Convention — Lake Placid, New York

By C. LOREN GRAHAM and ERIC C. JOHNSON

Left to right: C. Loren Graham, Eastman Kodak Co., Program Chairman; Eric C. Johnson, Eastman Kodak Co., Local Arrangements Chairman; Harry Teitelbaum, Hollywood Film Co., Convention Vice-President; Glenn E. Matthews, Eastman Kodak Co., Editorial Vice-President; G. Carleton Hunt, General Film Labs, Treasurer.

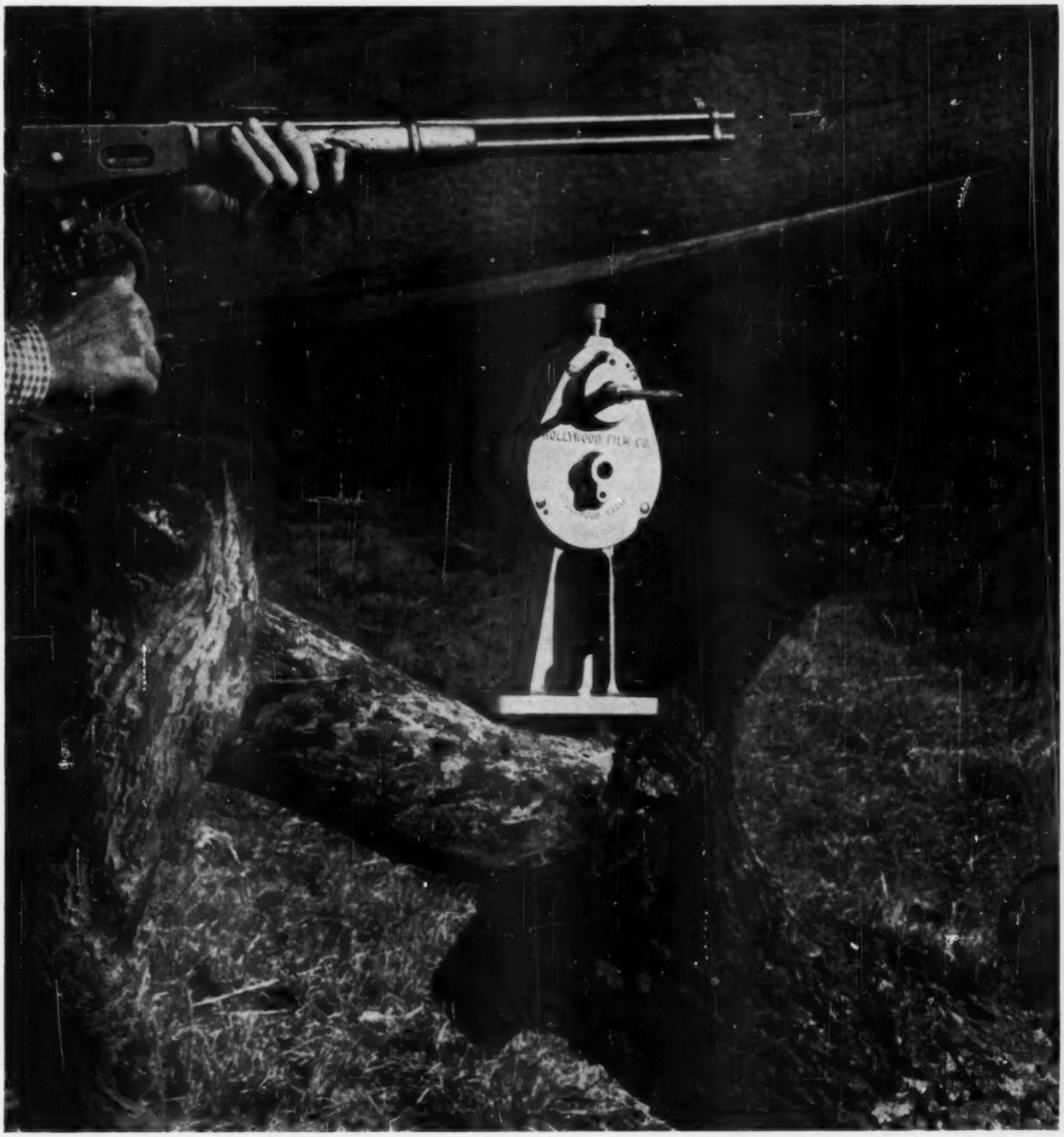
Once again, the Society met in the Lake Placid Club in upper New York State. The Society has had four meetings in this area, dating back to the late 1920's, and as before it proved to be an ideal location for our type of technical meeting. The Club is virtually turned over to the Society; thus for a week our members are thrown together for discussion—both technical and social—without distraction.

The Local Arrangements Committee, directed by Convention Vice-President Harry Teitelbaum and under the leadership of Eric Johnson, made the maximum use of both the hospitality and facilities of the Lake Placid Club. The result was a smooth running and well coordinated convention with opportunity for both serious discussion and pleasant social contact. Even in this well integrated location, the planning and execution of a national technical convention requires an alert awareness of many needs and a vigorous and conscientious attention to detail. Mr. Johnson and several of his committeemen, including Irving Ewig, Chairman of Hotel Arrangements, made frequent trips to Lake Placid to make arrangements with the Club. But since Lake Placid is not near a large city, the usual convention planning had to be altered and great dependence was placed on the cooperation of all the chairmen. Arthur Miller, DuArt Laboratories, as Vice-Chairman of Local Arrangements, provided excellent coordination of the activities of those involved from the New York City area. Several pre-convention get-togethers in New York assured all committeemen that their convention preparations were properly integrated with those of the staff at Society headquarters. The cooperation of local arrangements and the technical sessions was assured by constant communication with Loren Graham, the Program Chairman.

The close integration of the Lake Placid Club permitted several of the arrangements committees to be combined so that in many cases we found Arrangements Chairmen doing double duty. In addition, the efforts of John J. Kowalak and William H. Metzger, Administrative Assistants; Robert Burns, Membership; and Standish Holmes, Publicity, contributed greatly to the success and efficiency of the convention.

Projection and Public Address

The projection and sound equipment of the Lake Placid Club Agora Theater were ideally suited to the presentation of technical papers. The effectiveness of the physical plant was augmented by the skill and planning of E. B. (Jack) Hall and his capable projection committee. Jack Hall fulfilled the traditional roll of Chairman of the Projection Committee: but more importantly, he established a system of coordinating the presentation of Audio-visual material which could very well serve as a model for future Society conventions. Several weeks prior to the convention, a daily master projection plan was prepared which listed the individual speaker and the equipment he would require during his talk. A desk located near the registration area was set aside for the Projection Committee so that all speakers could turn in their audio-visual material prior to the time of their scheduled talk.


HOLLYWOOD FILM CO.

At the costume party.

Registration and Social Events

The registration of attendees was supervised by Charles LoBalbo. The ease with which the registration was handled was evidence of the thorough planning which went into this very important feature of the convention. George Gordon supervised the auditing of the registration funds.

Wally Hamilton photographed, on 16mm film, many of the pertinent technical and social events of the convention so that we can look forward to a newsreel review of our activities during our next convention. The film coverage was processed by courtesy of Saul Jeffee, Movielab Film Labs.

Despite a few rainy days (including one morning when we awoke to find the ground covered with snow) the convention was a congenial one. Many members arrived on the weekend preceding the start of registration to relax and renew old acquaintances. Through the arrangements of George Keene, who obtained the pre-session shorts, several feature films were shown during the week. The first one was shown on Sunday evening. Prior to this, motion pictures were projected of the 1927, 1928, 1950 and 1955 conventions at Lake Placid. Glenn Matthews narrated some details of the first two, at which he had been present. An interesting sound film of the 1961 Toronto Convention was also shown.

Ken Mason had set up a series of golf tournaments which were so arranged that members could play when they had free time. At the end of the week all scores were tallied and a multitude of prizes were awarded. These were presented by Ken during a buffet luncheon served on the Golf House terrace. Dr. A. Glasoe, Eastman Kodak, set the pace for all other golfers with a low gross of 80. The golf courses, both long and short, were in excellent condition. A backdrop of snow-covered peaks and tinted foliage provided both golfers and camera enthusiasts with a delightful setting.

Joe Dougherty arranged for many entertainment events, and a wide variety of prizes were made available through the generosity of the following companies:

Ansco
Bell & Howell Co.
Byron Motion Pictures, Inc.
CBS News
Camera Equipment Co.
Geo. W. Colburn Laboratory, Inc.
DuArt Film Laboratories, Inc.
E. I. du Pont de Nemours & Co.
Eastman Kodak Co.
W. J. German, Inc.
Hollywood Film Co.
Lab-TV
Movielab Film Laboratories, Inc.
Neumade Products, Inc.
Pathe Laboratories, Inc.
Reid H. Ray Film Industries
L. B. Russell Chemicals, Inc.

The costume-cocktail party and dance on Wednesday evening, arranged by Byron Roudabush, was one of the social highlights of the convention. Earl and Marie Sponable, with their lovely daughter Mimo, directed the assembled dancers in a grand march. The creative costumes provided the spark for an evening that we will long remember.

Ladies Program

The Lake Placid Club environment provided a pleasant atmosphere for the ladies. A continental breakfast was served daily in mid-morning. In the afternoon tea was served in the Garth Lounge accompanied by the pleasant music of Paul Jouard and his orchestra. Doc Feldman, Mrs. Feldman, and Mrs. Miller kept things interesting for the ladies by providing side trips such as a boat excursion on Lake Placid and a tour of the well known Will Rogers Memorial Hospital. They were equally well prepared during the several days of rain when dancing instructions, bingo, and bridge were provided.

Get-Together Luncheon

The members of the Society were officially welcomed to the convention by President John W. Servies. Saul Jeffee, as Chairman of the Get-Together Luncheon introduced our guest speaker, Barton Kreuzer. Because Mr. Kreuzer wished to present important audio-visual material in conjunction with his talk, the luncheon was adjourned to the Agora Theater so that the

Saul Jeffee, Movielab Film Labs, Chairman of the Get-Together Luncheon Committee, addresses the Luncheon.

projected material could be properly viewed. The text of Mr. Kreuzer's talk is published on p. 961 of this issue.

President Servies Speaks

In his address to the Get-Together Luncheon, President John W. Servies said:

"The organization that meets here today is an older, wiser and stronger organization than the one that met here six years ago. During the years since 1955 we have seen the prestige of the Society expand on an international as well as on a national scale and branch out into new and vital areas. The theme of this Convention, the integration of motion picture and electronic systems, is indicative of this new posture of the Society. . . .

"With the introduction of television, we witnessed the marriage of motion pictures and electronics. Later, the birth of magnetic tape recording solidified this union and today the motion picture and electronic union has produced many offspring. The applications of motion picture and electronic systems are multitudinous with new applications being thought of daily.

"Currently, airports are using these systems for traffic control; satellites equipped with these systems are sending data on outer space back to the earth; industry is utilizing these systems to quality check its products and business is using them in security systems.

"The lines that once separated motion-picture technology from that of electronics have virtually ceased to exist. Much of this electronic equipment has been built on the combined principles taken from numerous areas of research. And much of it has been operated and is being operated without standardization. This lack of standardization has had an adverse effect on some phases of the industry.

"I am happy to announce, however, that American Standards in the magnetic recording systems area will be forthcoming in the near future.

"A request by the Society for the establishment of an ASA Sectional Committee on Video-Tape Recording has been accepted by the American Standards Association, opening the way for Standardization of this important area of the industry. The Society's proposal was presented to a general conference on magnetic visual-aural recording held by the ASA early last July where it received enthusiastic approval pending its presentation to the communications and electronics division of the ASA's electrical standards board.

"SMPTE will serve as administrative sponsor of the committee to be known as Combined Visual-Aural Magnetic Recording for Television, C98. The scope of this committee, which will be composed of manufacturers, consumers, and representatives of other interested groups, will include definitions and engineering standards for combined visual-aural magnetic tape records of television signals. . . .

"While we negotiated during the years for an ASA facility to process magnetic tape standards, the SMPTE Video-Tape Committee prepared standards that are now ready to be forwarded to the C98 Committee for approval. We can expect, then, the start of standardization in the video-tape field within the very near future.

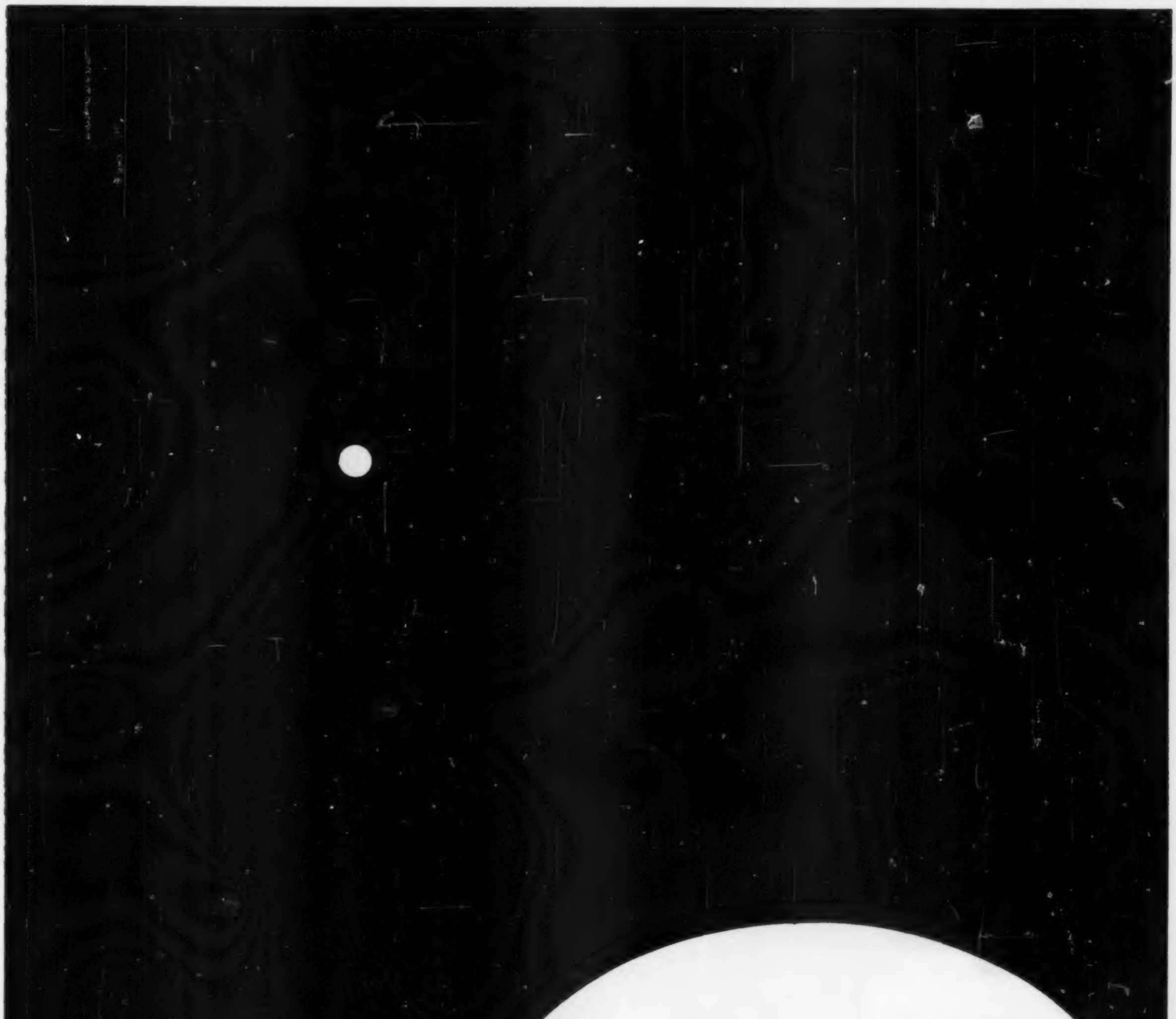
"The Society's leadership in the standardization of magnetic recording is but one facet of the new personality of the organization. Another, the sponsorship of the Fifth International Congress on High-Speed Photography, was on a world-wide scale. Now, the Proceedings of the Fifth Congress are about to be published, representing another stupendous undertaking of the Society.

"Scheduled for publication later this year, the Fifth Congress Proceedings will include more than 100 technical papers, French and German Abstracts of each of these papers and complete indexes, which previous Congress Proceedings have not contained. The 600-page book, very capably edited by Dr. J. S. Courtney-Pratt of Bell Telephone Laboratories, has been one year in the making. When it is published, this book will represent the most comprehensive and valuable work of its kind in existence.

"The increased stature of the Society has been recognized both within the industry and without in recent years. One incidence of this recognition occurred in 1960 when the Society was approached by the United States Office of Education regarding the sponsorship of a conference of engineers and educators to evaluate the adequacy and suitability of presently available types of audio-visual equipment and devices in terms of current and future educational needs; and to formulate engineering principles that will serve as guideposts in the development of audio-visual devices for use in education.

"The Society accepted the U.S.O.E. proposal and operating under a $25,000 Grant, SMPTE sponsored the conference at Princeton, New Jersey, on June 5, 6, and 7 of this year. Thirty one educators and engineers, representatives of SMPTE and the United States office of education attended this conference which was under the expert guidance of project director John Flory of Eastman Kodak Company.

"The results of this conference are now being processed. The Society, in cooperation with the United States Office of


Marconi's have sold
and delivered
more 4½" image orthicon
television camera channels
than all the other manufacturers
in the world put together.

Education, expects to make these results public within the near future.

"We have grown over the years in size as well as in prestige. Since we met here last the number of sections and Student Chapters has more than doubled. The most recent of these, the Detroit Section, was established only this year by action of the Board of Governors on a petition from members in the Michigan-Ohio area.

"While we have grown in size and increased in stature, our responsibilities to our members and to the industry have multiplied. A great deal remains to be done. Our test film program, for instance, bears ever increasing scrutiny. Engineering advances rapidly and, as a result, films become obsolete rapidly. They require periodic review. . . .

"We have a standard procedure for reviewing our standards. We should have, we have got to have, a similar procedure of periodic review of our test films. Our films are becoming obsolete too rapidly. It is unfortunate, but true, that some members of our technical committees have never seen the test films that they have helped to prepare. This should not be.

"The matter of test film review is even more pressing now than in the past. One, because the rapidity with which engineering is currently advancing almost defies the imagination; and, two, because the Society, in an effort to retain some of the services of the now defunct Motion Picture Research Council, has taken over the M.P.R.C. test film program. These M.P.R.C. test films should be reviewed within the framework of the Society's test film program as well as within the framework of the existing industry situation.

"Let us hope that through the task groups set up by Dr. Deane White, Engineering Vice-President, we can initiate periodic review of our test films, each one of them, by the members of the originating committees. Let us also hope that we will find it feasible to convene a symposium at scheduled intervals to allow test film users to discuss with us the merits and demerits of our films. If we are to serve the industry, and serve it properly, we must have this kind of comprehensive investigation of our test film program that we have found to be so valuable in our standards program.

"It has been repeatedly brought to our attention that there is a pressing need in the television broadcasting field for new test films with exactly controlled density characteristics. I urge the members of the television engineering committee to immediately work on standards for such a film so that they can be produced and be made available at an early date.

"The result of the test film review will undoubtedly lead to improvement in our test film program. As you all know, with increased quality comes increased costs. Each time we review a test film or prepare a new one, the costs have mounted considerably. We may find it necessary to bring our test film prices in line with these rising costs; however, we will do this only where we feel that the service to the industry justifies it.

"We are continually faced with the great task of keeping step with a fast-paced industry. Through the devoted efforts of our 6,500 members we shall continue to do so even as new vistas open up to motion picture and television engineers."

Awards Night

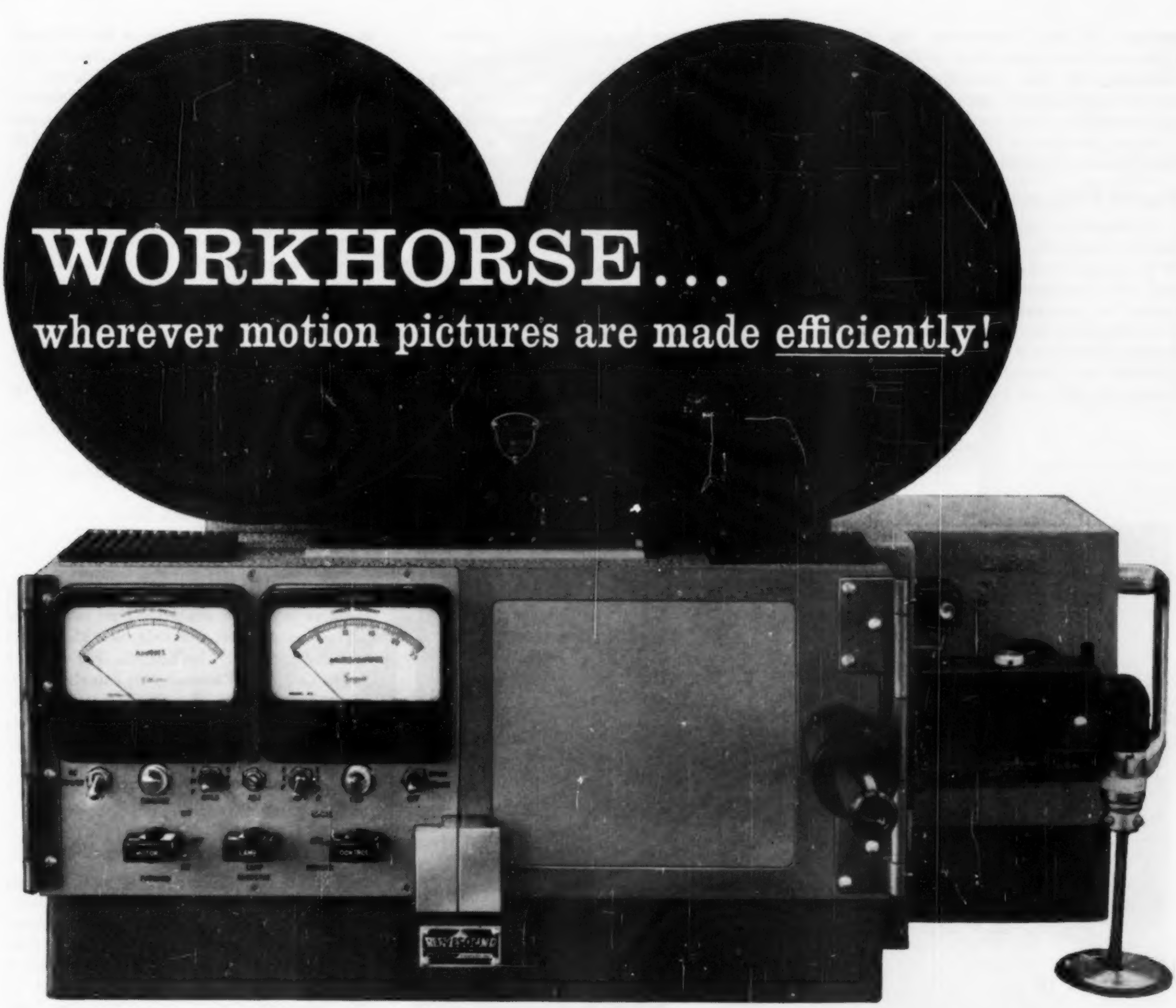
Tuesday evening was reserved for the formal presentation of awards and honors. President Servies presided, assisted by other officers and chairman of the award committees. The occasion was given a truly international flavor by the presence of Norikazu Sawazaki who came from Tokyo to receive an Honorable Mention certificate from the Journal Award committee as co-author of an outstanding paper. The evening was concluded with a very informative address by Lt. Col. John A. Powers, NASA. Complete awards coverage appears in this issue of the *Journal*.

Committee Meetings

Sixteen committee meetings were held during the week, as well as a meeting of Association of Cinema Laboratories.

Coffee Club

We were fortunate to have a Coffee Club located just outside the door of the Agora Theater, where the technical sessions were held. This allowed attendees to relax over a cup of coffee in off moments without getting too far away from the technical



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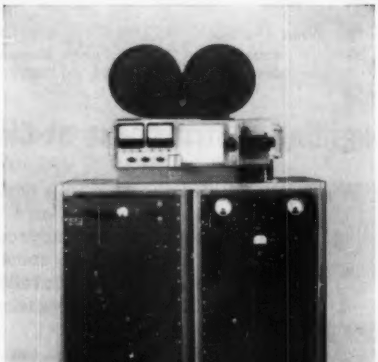

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sessions. At the convention the Coffee Club was kept open from 10:00 P.M. to midnight so that members could get together for pleasant conversation when the day's activities were through. The Society is very grateful to the Philip A. Hunt Company for sponsoring the Coffee Club.

Papers Program

A program of approximately 80 technical papers comprising 12 sessions was prepared by C. Loren Graham, Program Chairman, and his committee of Topic Chairmen under the general direction of Editorial Vice-President Glenn E. Matthews and Papers Chairman Robert C. Rheineck. The theme of the Convention, the integration of motion-picture and electronic systems, was well illustrated by a number of papers in several of the sessions. A secondary theme, systems of visual presentation, was demonstrated in a dramatic fashion in a well attended evening session. Some highlights of the technical sessions were a general discussion on the engineering aspects of subscription television, a lively session on 8mm commercial prints, and a demonstration of a new system of projection through a liquid gate. Interest in television methods and equipment, in high-speed photography, and in space photography, was maintained at a level that has been characteristic of recent conventions.

Each of the technical papers sessions was preceded by a motion-picture short subject. These shorts were assembled by George Keene, with the assistance of the Convention Vice-President, Harry Teitelbaum, and through the cooperation of a number of producers who submitted motion-picture prints for this purpose. Appropriate short subjects selected for each session were as follows:

Universe–Canadian National Film Board
Color Collage–Eastman Kodak Co.
Finger Lakes–Eastman Kodak Co.
Seconds for Survival–Bell Telephone Labs.
8mm commercial selections–Eastman Kodak Company, McGraw-Hill *Ozzie and Harriet, Life in the Woodlot, Caterpillar Tractors, Assignment Jet Colorama, Water Safety, The Magic Box That Remembers*
The New World of Stainless Steel–Wilding, Inc.
Photo Equipment at Vandenberg Air Force Base–USAF
Black Widow spider–Ken Middleham Productions
People of Venice–Churchill Films
Land of White Alice–Western Electric
Glass–Go Productions

In addition, three full-length 35mm features were presented. The first, *The Honeymoon Machine* (MGM), was shown on Sunday evening. The second, *The Pleasure of His Company* (Paramount), was shown on Thursday evening after the Treasure Hunt. The third, *The Hustler* (20th Century-Fox), was shown on Friday evening to the people remaining after the Convention. These motion pictures were highly appreciated by the audiences.

Space Photography and Image Sensing

The technical program was opened Monday morning by Richard Callais, Topic Chairman, and assisted by Waldemar Poch in the Vice-Chairman's position. Five papers were presented, ranging from research work in sine-wave response to the interpretation of cloud pictures from satellites.

Instrumentation and High-Speed Photography

A program of 12 papers was prepared by William Griffin, Topic Chairman, and Morton Sultanoff, Coordinator, and presented in two sessions. The first session was opened by Chairman Sultanoff. Interesting papers were presented on fiber optics and Kerr cell photography. A 30-nanosecond radiography system was described. The session continued, with Mr. Sultanoff in the chair assisted by George Silberberg, on Tuesday morning in the Forest Music Room. A varied group of papers on high-speed photography techniques and equipment were presented. It concluded in the Agora Auditorium with a 35mm motion picture regarding optical instrumentation at Vandenberg Air Force Base. This film proved so interesting that it was presented a second time later on during the Convention.

Systems of Visual Presentation

One of the highlights of the convention was a session on visual presentation with Adrian TerLouw as Topic Chairman. Following a paper describing a new approach to classroom films and a report on

the Midwest airborne television experiment, Mr. TerLouw and his co-workers presented a 90-minute demonstration on integrated methods of visual presentation using controlled lighting and multiple projection. It is anticipated that some of the advantages described by Mr. TerLouw will be used in future presentations at the SMPTE conventions. A start in this direction was made in the projected material of several subsequent papers during the Convention.

Laboratory Practice

The Topic Chairman, Geo. W. Colburn, was tragically called away during the early hours of the Convention by the sudden death of his daughter. James Wassell and Robert Colburn were able to take over George's responsibilities and a very fine session was held with Mr. Wassell in the chair assisted by Garland Misener. Two papers described split-screen techniques and presented a practical application in illustrating process control. Equipment papers described ultrasonic splicing of polyethylene terephthalate films and a new additive color printer and accessories.

8mm Professional Prints; Audio-Visual Techniques

A very interesting program on 8mm prints was assembled by Topic Chairman Neal Keehn, who occupied the chair during the session, assisted by John Turner. Two papers were presented on systems for making 8mm color prints, followed by seven papers on varied uses of 8mm, including teaching machines, educational films, newsreels and advertising.

Sound Reproduction

The session was held on Wednesday morning with John Forrest as Topic Chairman occupying the chair, assisted by Robert Gale. Two papers described quality control of sound, one by a new method of reducing the "motor-boat" effect, and one on evaluating flutter. These were followed by papers on testing magnetic stripes, and equipment for transferring sound to 8mm prints. An indexing system for ¼-in. magnetic tape in use in a large laboratory was described. After a discussion of magnetic sound standards there was a demonstration of the progress on photographic sound for 8mm film.

Panel Discussion: Engineering Aspects of Subscription TV

The panel was arranged by Gentry Veal who served as Moderator. The three systems described were Key TV, Telemeter Pay Television Systems, and Phonevision

TV Equipment and Techniques

Topic Chairman Richard O'Brien assembled the program and served as Chairman of the session assisted by Vernon Duke. A widely varied program was presented consisting of seven papers describing camera and exposure control and new camera equipment. It also included a description of a television broadcasting center and a closed-circuit system for x-ray inspection.

TV Recording

The program was assembled by Norman Olding, who also served as Chairman of the session, assisted by Harold Wright. The session opened on Wednesday afternoon, after the Panel Discussion on Subscription TV, with a paper on a time-element compensator. It was followed by a full session comprising seven papers Thursday afternoon. These described improvements of television tape recorders and video-recording cameras. There was a discussion on the editing of video-tape recordings and a discussion of a nonstudio instructional television system.

Cinematography

The Topic Chairman, William Hedden, had been very active in arranging papers for the Convention, not only for cinematography but for several other topics. He was assisted by Jack Behrend as Vice-Chairman. The session included seven papers, two of which described the use of motion pictures in medicine and medical education, and one describing a test of video tape-to-film in educational TV. One paper described a new 16mm reflex camera, and another an automatic exposure control. A thought provoking paper on a nonstandard use of 16mm to meet the 8mm print cost challenge, and a discussion of the advantages of single-system film production, completed the session.

Projection

Eric Yavitz was the Chairman, assisted by Robert Battey. There was a very interesting demonstration of a new system of projecting 35mm motion-picture film through a liquid gate. This was followed by four additional papers, two of which described new 16mm sound projectors. The Papers Sessions closed with two papers describing improved motion-picture projection lenses.

E. C. Hutter

J. A. Inslee

T. H. Moore

Society Awards

A special session for the presentation of awards was held on the evening of October 3 in the Agora Auditorium. President John W. Servies presided over the program; arrangements were under the direction of Byron Roudabush. Guest speaker was Lt. Col. John A. Powers, Public Affairs Officer, Space Task Group, NASA, who addressed the session on "The Astronaut," making special reference to communication techniques.

Fellows

Norwood L. Simmons, Chairman of the Fellow Membership Committee, presented certificates to those members elevated to the status of Fellow. The eighteen recipients were:

Frank G. Back
James A. Barker
John H. Jacobs
John Kiel
Kenneth Blair Benson
James W. Bostwick
Spencer W. Caldwell
J. S. Courtney-Pratt
John A. Flory
John L. Forrest
William D. Hedden
Don V. Kloepfel
George A. Mitchell
Howland Pike
Forrest A. Richey
Joseph Ruttenberg
Kurt Singer
Harry Teitelbaum

Journal Award

E. C. Hutter, J. A. Inslee and T. H. Moore were presented the 1961 Journal Award for their paper on "Electrostatic Image and Recording." The paper, which appeared in the January 1960 *Journal*, presented a method of image recording through simultaneous pickup and electrostatic storage of optical information by the use of a transducer. John L. Forrest, Chairman of the Journal Award Committee, presented the citation to the authors who are all with the Astro Electronics Division of RCA.

Four outstanding papers were recognized by the Journal Award Committee. Honorable Mention was given to: Norikazu Sawazaki, Motoi Yagi, Masahiro Iwasaki, Genya Inada and Takuma Tamaoki, Central Research Lab, Tokyo Shibaura Electric Co., Ltd., for "A New Video-Tape Recording System"; L. J. Krolak, RCA, Walter P. Siegmund, American Optical Co., and Robert G. Neuhauser, RCA, for "Fiber Optics — A New Tool in Electronics"; Rudolf Kingslake, Eastman Kodak Co., for "The Development of the Zoom Lens"; and Fred H. Perrin, Eastman Kodak Co., for "Methods of Appraising Photographic Systems: Part II — Manipulation and Significance of the Sine-Wave Response Function."

E. I. du Pont Gold Medal

For his basic pioneering research on the image converter camera, J. S. Courtney-Pratt, Bell Telephone Labs, was presented the E. I. du Pont Gold Medal. The award, established in 1960 to be presented annually for outstanding contributions to the development of techniques and equipment in the fields of instrumentation and high-speed photography, was presented to

Dr. J. S. Courtney-Pratt, Bell Telephone Labs, receives the E. I. du Pont Gold Medal.

Dr. Courtney-Pratt by Charles W. Wyckoff, Chairman of the E. I. du Pont Gold Medal Award Committee.

A native of Hobart, Tasmania, Australia, Dr. Courtney-Pratt is a graduate of the University of Tasmania and the University of Cambridge, England.

During World War II, he was associated with the Council for Scientific and Industrial Research in Australia and later with the British Admiralty. During that time he was engaged in research in ballistic instrumentation.

From 1945 to 1957, as a Research Student, Fellow of Gonville and Caius College, ICI Fellow and Assistant Director of Research in the Departments of Physical Chemistry and Physics at the University of Cambridge, Dr. Courtney-Pratt was concerned with research in applied physics, optics, multiple beam interferometry, high-speed photography, instrumentation, friction, adhesion, and the physics of the contact of solids.

In 1958 he joined Bell Telephone Laboratories and since that time he has been engaged in research in methods of high-speed photographic recording, x-ray recording, optics, optical instrumentation, optical masers, and fiber optics, as well as research in the properties of materials, strain measurement, adhesion, friction and the contact of solids.

Universally acclaimed for his varied scientific capabilities, Dr. Courtney-Pratt was awarded the Sir Charles Vernon Boys' Prize for experimental physics in 1954 and the Civic Medal in Paris in the same year. In 1958 he was selected a Fellow of the Royal Photographic Society of Great Britain. For his many outstanding contributions to high-speed photography, the Photographic Society of Vienna bestowed its Gold Medal upon him during its 100th anniversary celebration in 1961.

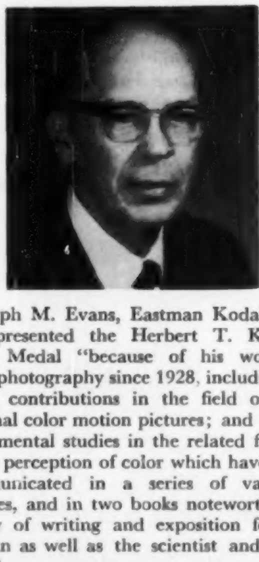
Since 1940 he has served as a consultant to government departments and industrial firms in Europe, Australia and the United States.

During the past twenty years, Dr. Courtney-Pratt has published fifty technical papers and reports in the field of high-speed photography, including an outstanding work on *Image Dissection in High-Speed Photography*, as well as forty papers in other fields.

He is Editor of the *Proceedings* of the Fifth International Congress on High-Speed Photography. During the Fifth Congress, Dr. Courtney-Pratt served as Associate Program Chairman for Papers from Abroad.

He is an Associate of the Institute of Physics of England, an Associate Member of the Institution of Mechanical Engineers of England, a Fellow of the Royal Photographic Society of Great Britain, a Fellow of the Cambrige Philosophical Society, a Member of the Society of Photographic Instrumentation Engineers and a Fellow of the Society of Motion Picture and Television Engineers.

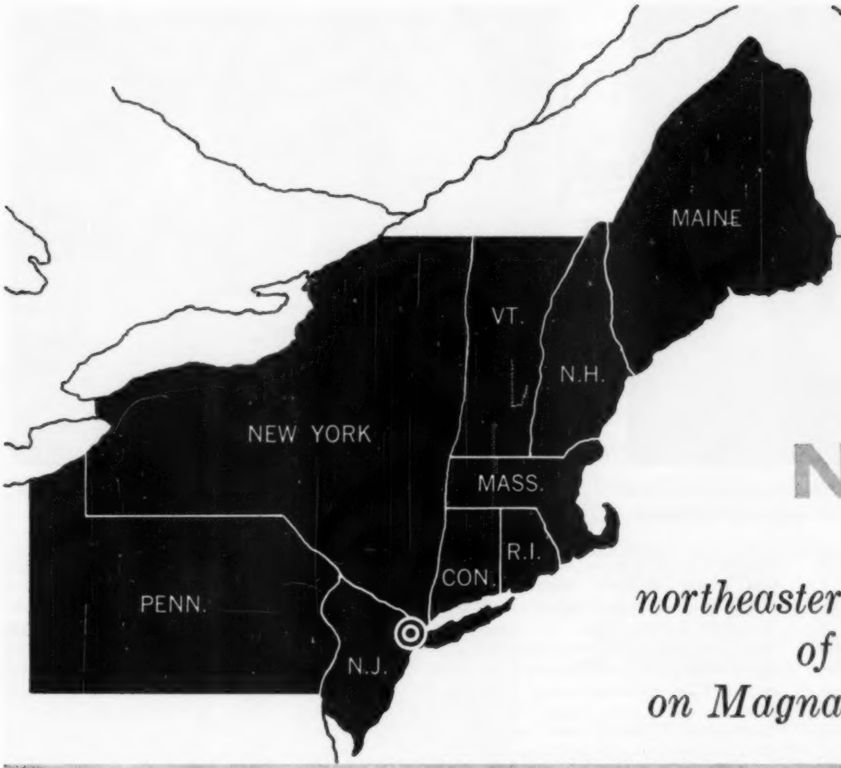
Herbert T. Kalmus Gold Medal



Ralph M. Evans, Eastman Kodak Co., was presented the Herbert T. Kalmus Gold Medal "because of his work in color photography since 1928, including his many contributions in the field of professional color motion pictures; and for his fundamental studies in the related field of visual perception of color which have been communicated in a series of valuable lectures, and in two books noteworthy for clarity of writing and exposition for the layman as well as the scientist and engineer."

In the absence of the Chairman of the Herbert T. Kalmus Gold Medal Award Committee, Herman H. Duerr, Ansco Technical Division, the citation was presented to Mr. Evans by Deane R. White, Engineering Vice-President.

Mr. Evans is the Director of the Color Technology Division of Eastman Kodak Co. During his many years in this capacity he has been closely associated with work on the development of new motion-picture films and processing laboratory techniques. In addition, he has carried on fundamental



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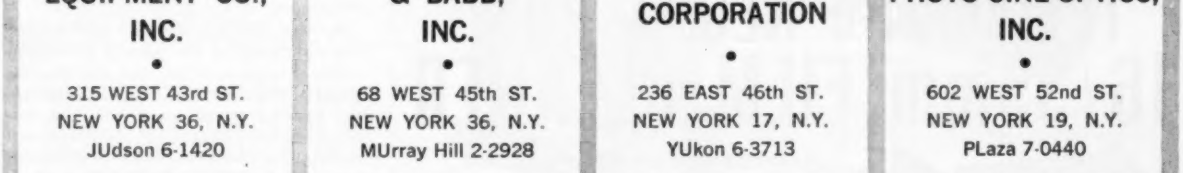

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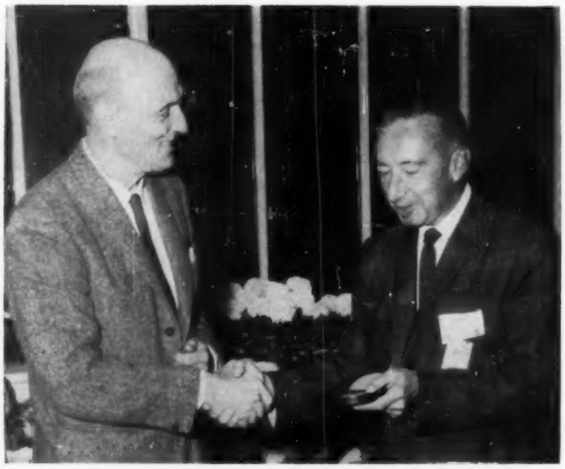
Norikazu Sawazaki, Tokyo Shibaura Electric Co., Ltd., receives the Journal Honorable Mention Award from President Servies.



The Samuel Warner Memorial Award is presented to Walter R. Hicks, Reeves Soundcraft Corp.

studies in the specialized field of visual perception.

His long association with color photography began in 1928. Upon receiving a B.S. in theoretical physics from Massachusetts Institute of Technology, Mr. Evans joined the Kodak Research Laboratories and worked on amateur color motion-picture films. A year later he became a member of the staff of Fox Film Corp. in the field of color photography. He returned to Kodak in 1935, and in 1940 was made assistant superintendent of Color Processing and Development in the Research Laboratories. In 1945 he was appointed superintendent in charge of the newly formed Color Control Department in the Film Manufacturing Division. In 1953 the name was changed to the Color Technology Division with Mr. Evans as the director, the post which he still holds.

Mr. Evans is a Fellow in four professional societies; the Society of Motion Picture and Television Engineers, the Society of Photographic Scientists and Engineers, the Optical Society of America, and the Illuminating Engineering Society. In addition, he is an associate member of the American Psychological Association and holds membership in the American Society for Aesthetics. He has been very active in the Inter-Society Color Council — the chairman of the delegates of the Society of motion Picture Engineers to this Council for many years, a past chairman of the Council, and secretary of the Council since 1952. He is also an honorary member of Sigma Xi.

He was the recipient of the Samuel Warner Award of the Society of Motion Picture Engineers, 1949, and the Progress Medal of this Society in 1957. In addition, Mr. Evans received an award "for distinguished service to the field of professional photography" from the Professional Photographers of America in 1955, and the Godlove Award from the Inter-Society Color Council in 1959.

Mr. Evans continues his interest in, and investigation of visual phenomena related to color. In his latest book, *Eye, Film and Camera in Color Photography*, he presents this complex subject in a form useful to those involved in making color pictures.

Samuel Warner Memorial Award

In recognition of his outstanding contributions in the design and development of methods and apparatus for sound-on-film in motion pictures, Walter R. Hicks, Vice President in Charge of Special Projects, Reeves Soundcraft Corp., was the recipient of the Samuel L. Warner Memorial Award. In the absence of the Warner Award Committee Chairman, Loren Ryder of Ryder Sound Services, the award was presented by Norwood L. Simmons, Past President.

Upon receiving a B.S. in mechanical engineering from Catholic University in 1927, Walter R. Hicks was employed by Fox Movietone News. There he participated in the early production of newsreels and helped to develop early film rerecording practices using glow lamps, light valves and galvonometers. In 1944 Mr.

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Hicks began his association with Reeves Sound Studios where he remained until 1947 when he joined Reevesound Co., Inc.

Among his many developments in the field, Mr. Hicks has been awarded patents for an automatic radio paging system using 16mm photosound audio slides, a double-system film-driven magazine magnetic recorder, an electro-mechanical talking book, and a book with (mechanical) talking pages.

In addition to his patented developments. Mr. Hicks has made many other contributions to the field including; a biplanar, two-string, variable-density light valve; a reverse biased, nonclashing, two-string variable-density light valve operating from zero mils mean spacing; a crossed string, fixed slit, push-pull variable-area light valve; a xerographic sound-recording system; an automatic splice-actuated photo-sound de-blooper; 16mm and 35mm photo and magnetic sound recording and reproducing systems including recorders, re-recorders, projectors and footage counters, interlocked and reversible; a nonintermittent 16mm film editor for photo and magnetic soundtracks with picture; an early multitrack magnetic sound recording and reproducing system; early electronic printer systems; magnetic flight-instrumentation recorders; and magnetic facsimile storage recorders.

As further testimony to his ability, Mr Hicks has been called upon to install sound-recording and motion-picture installations in the United States as well as Venezuela, Cuba, Canada, Iraq, Pakistan and Puerto Rico.

At present Mr. Hicks is involved in the development of special devices involving magnetic media; research and development in the fields of instrumentation, facsimile and electro-mechanical devices; and special motion-picture recording and projection applications.

Honorary Membership

Alfred N. Goldsmith, consultant engineer, cited for his many eminent services to the advancement of engineering in motion pictures and television, has become the tenth member during the 45-year history of the Society to be elevated to honorary membership status. The award was presented by Executive Vice-President Reid H. Ray, in the absence of Barton Kreuzer, committee chairman.

Dr. Goldsmith, a Past-President of the Society, has been a member of SMPTE for 33 years. He is a graduate of the City College of New York and Columbia University.

A professor of electrical engineering at CCNY from 1918 to 1923, he was vice-president and general manager of Radio Corp. of America during the 1923 to 1931 period. Since 1933, Dr. Goldsmith has served as a consulting engineer for Radio Corp. of America, the National Broadcasting Co. and Eastman Kodak Co.

Chairman of various panels of the National Television Systems Committee from 1940 to 1954, Dr. Goldsmith received the Modern Pioneer Award from the National Association of Manufacturers in 1940, the Medal of Honor from the Institute of Radio Engineers in 1941, the Townsend Harris Medal from the College of the City of New York in 1942, the Medal Award from the Television Broadcasters Association in 1945, the Achievement Award from the RCA Laboratories in 1950, the Special Citation from the Radio Pioneers in 1952, the Founders Award of the Institute of Radio Engineers in 1954, and the Progress Medal Award of the SMPTE in 1956.

The holder of nearly 200 patents in the fields of motion pictures, radio, television, color television and air conditioning, Dr. Goldsmith is currently concerned with industrial and defense projects primarily in the electronic, television and motion-picture fields.

Among many other organizations, he holds membership in the American Institute of Electrical Engineers, the American Physical Society, the American Association for the Advancement of Science, the Acoustical Society of America, the New York Academy of Sciences, and the International College of Surgeons.

Progress Medal

For continued technical contributions over a period of years, Cyril J. Staud, Vice-President and Director of Research, Eastman Kodak Co., received the Progress Medal Award. This Award is given in recognition of research and development which has resulted in significant advances in the development of motion-picture or television technology. Dr. Staud was introduced by John G. Frayne, committee chairman and recipient of the Progress Medal in 1947.

Cyril J. Staud was born in Rochester, New York, on October 19, 1898. He attended the University of Rochester where he received his B.Sc. in 1920 and his M.Sc. in 1922. He held an honorary fellowship in the department of chemistry at the Massachusetts Institute of Technology in 1923 and was granted a Ph.D. in Organic Chemistry by that Institute in 1924.

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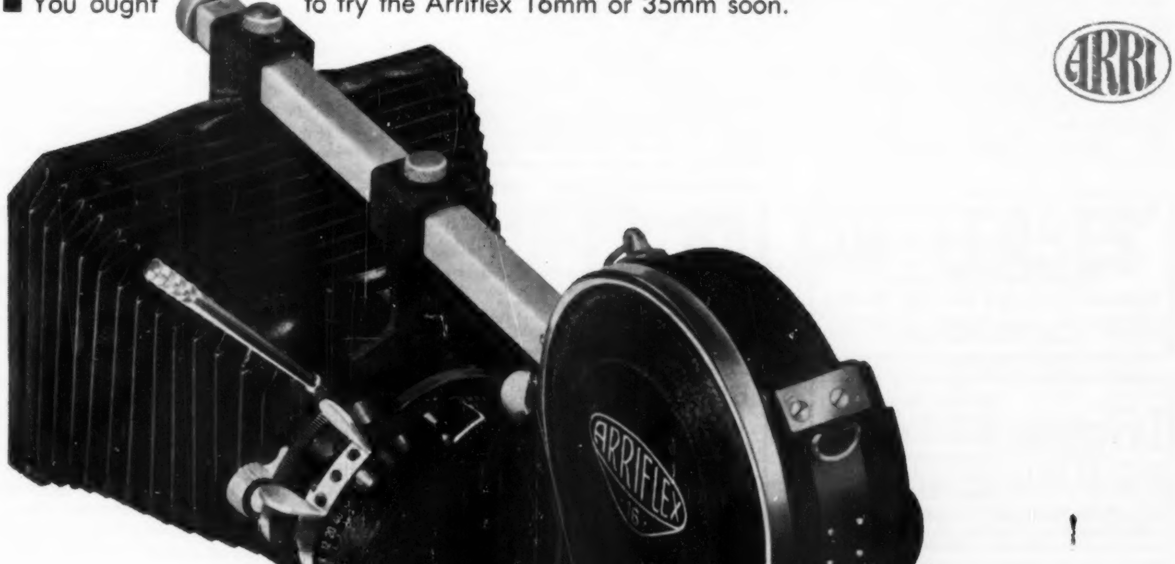

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Dr. Staud joined the Research Laboratories of the Eastman Kodak Co. in July 1924 as a research chemist and later became research supervisor doing research on cellulose and cellulose derivatives in the department of organic chemistry. In these fields, his pioneering research in cellulose ester technology played an important part in Kodak's production of improved safety film.

In 1931 he was appointed head of a newly organized emulsion research division. While he was superintendent of this division, Dr. Staud actively guided research and development activities which resulted in significant advances in photographic emulsions. Researches under his direction resulted in new emulsion making techniques and in the introduction of new black-and-white and color materials. Under his supervision, the emulsion research division also made numerous special emulsions for various scientific uses of photography, including astronomy, spectroscopy, and nuclear physics. He also encouraged basic research on photographic emulsions, spectral sensitivity, and latent image formation.

From 1943 to 1947, Dr. Staud served as Acting Director of the Research Laboratories whenever the Director, Dr. C. E. K. Mees, was absent. In August 1947 he was appointed Director. In November 1955 he was elected Vice-President in Charge of Research to succeed Dr. Mees who retired at that time.

He has published numerous scientific papers on several subjects including cellulose and its derivatives, photographic emulsions, industrial research, color photography and documentary reproduction.

A prolific inventor, he has had well over 100 U.S. and foreign patents issued to him. Dr. Staud has lectured before many technical, industrial and university organizations.

Since he became director of the Laboratories in 1947, the research interests have broadened considerably. Working closely with the manufacturing divisions, new materials and processing equipment have been developed in both amateur and professional photography as well as specialized applications. Examples of the last are television, documentation, radiography and graphic arts. An intensive program of research in color has been continued under Dr. Staud's supervision, which resulted in the manufacture by the Kodak Co. of several new color materials, the most recent being the new Kodachrome II Film.

In addition to technological investigations, strong emphasis has been continued on basic theory with the publication by the Laboratories of many scientific papers.

Dr. Staud has been a member of the American Chemical Society for many years and served as Secretary of the Cellulose Division 1927–31. He is a Fellow of the Photographic Society of America, the Society of Motion Picture and Television Engineers, the Royal Photographic Society of Great Britain, the New York Academy of Science, the Society of Photographic Scientists and Engineers, and the Rochester Museum of Arts and Sciences. He is a member of the American Association for the Advancement of Science, the Optical Society of America, and the Professional Photographers of America. Two honorary

fraternities list him as a member: Sigma Xi (honorary scientific) and Alpha Chi Sigma (honorary chemical).

One of the earliest radio amateurs in the Rochester area (since 1910), Dr. Staud still operates a transmitter having the present call K2DQ. He is a member of the American Radio Relay League. During World War I, he was a member of the Student Army Training Corps at the University of Rochester. In the summer of 1922, he worked on the synthesis of high explosives for the U.S. Army Ordnance Department. During World War II, he was a member of the Rochester War Research Committee. Presently he is a member of the New York State Advisory Council for the Advancement of Research and Development.

As the Director of one of the largest research laboratories in America, Dr. Staud has shown strong leadership, both technically and administratively. His receptive mind, his enthusiasm for investigation, and his outstanding ability to foresee clearly the practical application of ideas have distinguished his work for many years.

Response by Dr. Staud

Edited from an address given by Dr. Staud following the presentation to him of the Society's Progress Medal for 1961 at the Awards Session on October 3, 1961, at the Lake Placid Club, Essex County, N.Y.

Progress in Cinematographic Materials

The name of the Society of Motion Picture and Television Engineers implies, as I see it, a combining of the efforts of those engaged in work on silver halide photography on the one hand, and those working in the field of electronics and associated subjects on the other. Some of the Progress Medalists have been from the latter, and some from the former. It would not be appropriate to distinguish between the two, since in television motion pictures play such an important part and, conversely, television has had such a profound effect on professional motion pictures.

In the early years of 1924–1931, my efforts were directed largely toward the cellulose ester technology, and it was of course uppermost in our minds that we might attain an improvement in the film base used in the motion-picture field. As a result of a group effort, we did attain a modicum of success, although of course there have been marked advances in the cellulose ester technology and in film base made from cellulose esters during the intervening period.

In 1931, I was asked to take charge of the Emulsion Research Division of the Laboratories. Emulsion Research was a new division formed at that time, and it was the desire of the Kodak management that someone be placed in charge who would bring to it a knowledge of organic chemistry which had not been widely employed in silver halide emulsion technology to that time. This may be an ad hoc, propter hoc explanation. At any rate, it resulted in the introduction of organic compounds into silver halide photography in a fashion which, so far as I know, had not previously been attempted.

Kodachrome and Other Color Processes. It was shortly after the founding of the Emulsion Research Division of the Kodak Research Laboratories that serious work was begun on the Kodachrome process. This was greatly facilitated by the discovery at about that time of sensitizing dyes which did not wander from layer to layer. Since a color photographic material, which had a multilayer structure, was required, this was a matter of great significance to us. There were intensive efforts and many headaches in these early years which resulted from attempts to produce a material which could yield a pleasing color motion picture on a projection screen for amateur use. Subsequently, a modification of this process was used by Technicolor under the name of Monopak. The use of Monopak involved special laboratory work for which at that time only Technicolor was equipped. Even under these conditions, the results were not entirely adequate, and the incorporated coupler materials soon replaced Monopak. However, it was not until 1950 that the color negative-positive process was introduced, and it was in this area that those of us in the Emulsion Research Division and those concerned with processing found our greatest challenge. The quality requirements of a professional color negative and color print presented problems which were much more difficult than any which we had solved previously. The invention of colored couplers for use in the color negative had, of course, a very definite effect, and contributed greatly to the color quality which we could achieve in a professional color print material.

The matter of an intermediate film not only presented difficulties from the investigational point of view, but appeared to present an almost impossible situation from a production standpoint. I would therefore like to take this opportunity to mention that exploratory work, early-development and late-development work cannot contribute to progress in any field unless it is followed by satisfactory production. This, again, means not only suitable machines but competent people with enthusiasm and a will to overcome obstacles. This was exemplified in a singular fashion in the intermediate color film which was made available originally for professional color motion-picture use in 1951, and in a greatly improved form in 1956. The problems of production of this material cannot fully be appreciated by the users.

However, while work in the field of color photography, both for projection in theaters and for broadcasting by color television transmitters, has had its spectacular aspects, work on black-and-white films for professional use in motion pictures and in television has not been neglected.

Films for Television. There have been significant advances in the characteristics of black-and-white negative materials used for motion pictures and for television. This has been largely in the direction of increased sensitivity with decreased graininess. For television, specifically, there have been produced several new types of films, including new materials for kinescope recording. When using the new fast films in studio production work, an important advantage is that less light is required on the set which means lower production costs.

The problems associated with television, in terms of optimum set lighting to maintain the scale within that of the television transmission system, and to improve the quality of kinescope presentations, have been the subject of considerable investigation. As a result, it appears that the overall progress in this area has been such as to afford those of you who produce motion pictures the materials with which considerable improvement in quality has been attained. Furthermore, it appears probable that the theater-going and the television-watching public has been conscious of the improvement in quality which is seen on the theater screen and on the home television receiver. Here, again, those of us who have been concerned with the developments in this field have been able to make progress as a result of our combined ideas and efforts.

Special Applications of Motion Pictures. Motion-picture photography, of course, finds many applications outside the field of entertainment from the standpoint of both the professional and the amateur. In the field of science, considerable use of motion pictures has been made, and very effectively, in time-lapse photography. This has been employed in such fields as the study of the formation of crystals and the growth of flowers, to name two rather common examples. These are of importance to the crystallographer and to the botanist. In the field of technology, it is frequently necessary to investigate the operation of machines. The stroboscope has of course been a great help in observing moving mechanical parts, but of greater importance has been the use of high-speed motion-picture photography. Uses of motion-picture photography in this field have increased greatly during recent years, and the bibliography prepared for the Fifth International Congress on High-Speed Photography in 1960 has about 1400 references. Motion-picture photography in connection with the launching of rockets and their behaviour in flight is of course familiar to all of you. This is an expanding application which will probably find increased use in the future.

It might be of interest to consider for a moment the relation of motion-picture photography to time. It enables us to review events in the rather distant past, such as the return of troops in World War I. In high-speed photography, time is expanded so that events occurring very rapidly can be observed as proceeding slowly. In those cases where the rates are low, such as the growth of flowers, time can be compressed by time-lapse photography. Motion pictures of the launching of a rocket record the present or the very recent past. Through motion pictures, therefore, we can, in effect, bring back past time, compress and expand time, and record the present, but what we would like most of all, unfortunately, motion pictures cannot do — tell us of events to come.

There are of course many other fields of photography in which we have participated from various standpoints over the years, including new materials for use

by the astronomers. It was a source of vicarious satisfaction to learn that last year it was possible to record on the surface of the earth objects which are 6 billion light years away. When the light left these objects, the world was very young; probably the world is still young in comparison to what the future may hold.

It appears certain to me that in the coming decades the progress which will be made will dwarf that which has taken place. The work of the Progress Medalists of this decade will be regarded as "earlier developments" by those who may feel that our efforts, while possible pioneering, were, in the light of subsequent achievements, rather primitive.

In conclusion, I wish to thank those who have brought about the award of the Progress Medal to me this evening, and to tell you that my appreciation will not cease with the closing of this session of the Society of Motion Picture and Television Engineers, but will continue on into the amazing future which we see ahead.

6TH INTERNATIONAL CONGRESS · THE HAGUE HOLLAND · ON HIGH-SPEED PHOTOGRAPHY · SEPTEMBER 17-22-1962

6

6th International Congress on High-Speed Photography

A folder in English, French and German, received from the Congress Chairman, Dr. J. G. A. de Graaf, contains more details to be added to the information about the 6th Congress published in the November *Journal*, p. 915. The preliminary program of the Congress, which will take place at the Kurhaus Hotel, Scheveningen, The Netherlands, September 17–22, 1962, will be as follows:

Sunday, September 16

Afternoon and evening: Registration at the Congress Bureau, Kurhaus Hotel, Scheveningen
Evening: Informal gathering

Monday, September 17

Morning: Inaugural session
Afternoon: Plenary session
Evening: Dinner (Javanese rice-table)

Tuesday, September 18

Morning: Plenary session
12:00 Noon: Opportunity to attend the State opening of Parliament by Her Majesty the Queen of the Netherlands
15:00: Plenary session
Evening: Free

Wednesday, September 19

Morning: Plenary session
Afternoon: Plenary session
Evening: Official reception

Thursday, September 20

Optional tours (see below)

Friday, September 21

Morning: Plenary session
Afternoon: Plenary session
Evening: Farewell party

Saturday, September 22

Morning: Final session

Tours

On September 20 there will be a choice of a number of excursions through some characteristic Dutch countryside and to some towns of historic interest. One will be to Amersfoort, to see the reclamation of the Zuyder Zee; other tours will go to the Museum Kröller-Müller, where there is a famous collection of Van Goghs, to Rotterdam, and to Delft, the home of Vermeer.

Hotels

Rooms have been provisionally reserved in the following price classes in a number of hotels in the vicinity of the Conference Hall:

Single bedroom: without bath — Dfl. 10.50 to 19.50; with bath — Dfl. 21.00 to 23.50.

Double bedroom: without bath — Dfl. 21.00 to 42.00; with bath — Dfl. 26.00 to 47.00.

Boarding House (bed and breakfast, per day)

Single bedroom: Dfl. 6.50 to 12.00; double bedroom: Dfl. 13.00 to 24.00.

Reservations

Applications for reservation and accommodation forms should be made before February 15, 1962, to the Secretariat the 6th International Congress on High-Speed Photography, 14 Burgemeester de Monchyplein, The Hague, The Netherlands. Applicants should indicate at the same time whether they plan to present a paper or not and, if so, include the title.

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employment service

These notices are published for the service of the membership and the field. They are inserted three months, at no charge to the member. The Society's address cannot be used for replies.

Positions Wanted

Cameraman—Optical Printing Specialist. Long experience Hollywood studios and East Coast laboratories; own bench optical printer assembled with Acme camera (35) and projector (35 & 16) printing Eastman Ektar, 1000-ft bi-pack for masters, plus all accessories, cost $18,000. Seek association with producer or laboratory including equipment at nominal fee or will sell machine at less than half original cost. Last 8 yrs chief optical printing at Consolidated Film Industries, Fort Lee. Will relocate. W. G. Heckler, 21 West 58 St., New York 19. PL 3-7067.

Audio-Visual Specialist. Extensive communications background: motion pictures, radio, audio-visual techniques. Over 5 yrs experience in motion-picture production and direction, script writing, editing and industrial audio-visual department administration. Secondary experience as radio news, script and continuity writer and in editing and writing of technical reports, proposals and brochures. Age 29, married, B.S., M.S. in Audio-Visual Communications. Willing to relocate. Resume on request. P.O. Box 502, Stamford, Conn.

Instrumentation and High-Speed Photography Coordinator. All military and civilian equipment and techniques; motion-picture and still; also metric applications. Resume on request. Reply to Photo, c/o Mercurio, 28-17 Astoria Blvd., Long Island City 2, N. Y.

Positions Available

Electronic Engineer. To supervise Sound Maintenance Dept. of large modern motion-picture studio. At least 5 yrs professional experience in sound recording essential. Thorough knowledge of solid state and tube audio circuits, magnetic and optical sound recording systems, sensitometry and transmission measurement techniques required. Must have ability to do independent design work on special projects. Administrative experience desirable. Excellent working conditions in suburban Montreal. Send resume, with academic background, to: Personnel Dept., National Film Board of Canada, P.O. Box 6100, Montreal, Que., Canada.

Photographer with broad experience in high-speed cinematography. Must be familiar with 16mm Eastman High-Speed Camera, Arriflex and Cine Special. Knowledge of time-lapse, standard motion-picture and still photography techniques also desirable. Training and experience will determine starting salary in $6000 to $9000 range with excellent growth opportunities in growing in-plant department. All replies confidential. Send resume to: Photography Dept., Corning Glass Works, Corning, N.Y.

Television Broadcast Technician. Group stations offer opportunities for men with initiative and basic knowledge of TV fundamentals. Write G. G. Jacobs, Corinthian Broadcasting Corp., 302 So. Frankfort, Tulsa, Okla.

Exchange Job—TV Cameraman. German TV cameraman in Munich, Germany, TV studio would like to exchange job for 1 yr with TV cameraman in New York, Washington or Philadelphia, including fully furnished apartment in beautiful section of Munich. Write: F. Sittl, München-Bogenhausen, Buschingstrasse 45 XII, Germany. Additional information in New York from: Ursula Heemann, 123 East 39 St., New York 16. YU 6-5478.

Film Technician. Competent, experienced man for technical evaluation of film and to maintain quality control in large film video-tape operation. Send resume and references to: Supervisor of Recording Services, WTTW, 1761 E. Museum Drive, Chicago 37, Ill.

Theatre Sound Engineer. Indian company requires sound engineer for theatre installation and service. Administrative and sales experience desirable. Please send resume and salary requirements in full confidence to: Cinefones, 3 New Queen's Road, Opp: Opera House, Bombay 4, India.

Television Specialists. Require professionals for planning, executing and operating closed-circuit mobile television equipment, and to direct work of other television specialists and technicians. Requires travel in United States. Send resume and inquiries to General Dynamics/Astronautics, P.O. Box 1128, Dept 130-60, San Diego 12, Calif. Attn: Warren B. Jones, Jr., Employment Mgr.

Motion-Picture Sound-Recording Engineers. Motion-picture unit, industrial, requires alert soundmen for staff. Must know all phases of sound recording, transferring, mixing and theory. Send resume and inquiries to General Dynamics/Astronautics, P.O. Box 1128, Dept 130-60, San Diego 12, Calif. Attn: Warren B. Jones, Jr., Employment Mgr.

Color Motion-Picture Printer with experience. Will consider related experience in film handling, negative splicing and other laboratory skills.

Motion-Picture Laboratory Technician with experience in 35mm color processing.

Filmstrip Cameraman. Fully experienced, familiar with Oxberry equipment. Able to work without supervision.

Color Timer for filmstrip laboratory, experienced. Salary open on all positions. Reply to: M.G., 68-46 Groton St., Forest Hills 75, N.Y.

Motion-Picture Equipment Maintenance and Repair Men. Experienced with Mitchell, Arriflex, etc. cameras, Moviolas, projectors, lighting equipment, machine shop, optical and audio equipment. Good salary and opportunity. Florman & Babb, 68 West 45th St., New York 36.

Design Engineer — Electromechanical Photographic Systems. Position responsibility includes designing and engineering components of production electromechanical photorecording equipment. Components consist of shutters, film transport mechanisms, lens servos, etc. Formal mechanical engineer's training or acquired equivalent coupled with basic electrical and electronic theory essential. Must be familiar with design and production problems of castings, components, plastic moldings, screw machine parts, etc. Tektronix, Inc., growing manufacturer of electronic instruments, provides excellent compensation including profit sharing and benefit programs. Write giving details of experience and training to: Dan Thompson, Professional Placement, Tektronix, Inc., P.O. Box 500, Beaverton, Oregon.

Sound Transmission Engineer. Familiar production and dubbing mixing, variable-area cross-modulation tests, and installation techniques for new motion-picture studio in British Columbia. Mild weather, good working conditions. Hollywood resident preferred. Salary commensurate with experience. H. M. Tremaine, 9658 Haddon Ave., Pacoima, Calif. EM 9-0386.

Résumés / Resumenes / Zusammenfassungen

The Society is grateful to the following authors for supplying translations: Deane R. White—*French, Spanish, German;* L. R. Teeple, Jr.—*French, Spanish, German;* R. R. Epstein and Leo M. O'Donnell—*French, Spanish, German;* F. P. Alles—*French, Spanish, German;* R. G. Neuhauser—*French, German.* Translations contributed by Pablo Taberno, Alex Quiroga and Lucas G. Lawrence are also gratefully acknowledged.

Les systèmes électroniques et cinématographiques de l'Age Interplanétaire

BARTON KREUZER [961]

Au cours des cinq dernières années, les intérêts de notre Société ont évolué au-delà de toute prédiction sous l'effet des projets d'exploration et d'utilisation des espaces interplanétaires. Les domaines établis de notre industrie ont poursuivi leur essor dans le sens prévu: les emplois du film et du ruban-images se sont accrus dans les émissions de télévision et dans la télévision à circuit fermé; les intérêts audio-visuels ont grandi et comprennent maintenant le film sonore de 8 mm, et les activités relatives aux systèmes photographiques et électroniques ont pris une nouvelle ampleur dans les recherches, la technique et la documentation. Notre rôle dans l'Age Interplanétaire a été de créer des satellites à des fins météorologiques et de communication, ainsi que des systèmes destinés aux explorations lunaires et interplanétaires, pour lesquels nous avons réalisé des systèmes de télévision et de cinéma. Ces systèmes auront des répercussions importantes sur l'industrie, en particulier dans les domaines de l'enseignement et de la photographie à grande sensibilité, ainsi qu'aux fins de miniaturisation et de vigueur de présentation.

La réunion de 1961 de l'ISO, TC 36 Cinématographie

DEANE R. WHITE [967]

Des représentants des agences de standardisation de dix pays se sont assemblés à Garmisch-Partenkirchen, Allemagne, por continuer le travail de l'ISO/TC 36, cinématographie. Le travail s'est étendu sur de nombreux sujets concernant les affaires internationales en cinématographie. Cinq situations courantes sont décrites, illustrant des aspects importants de ce travail. Sept groupes de travail ont été autorisés de continuer le travail à des projets incomplets. Il est important pour l'industrie des Etats Unis dans ce domaine que ces activités continuent.

Principe et essai du concept d'une caméra ultra-rapide permettant simultanément l'enregistrement continu et image par image

L. R. TEEPLE, JR. [969]

Un principe simple permettant simultanément l'enregistrement continu et image par image ("streak and framing record") d'un même évènement, rend possible l'observation directe et distincte d'une image pendant l'enregistrement continu d'évènements ultra-rapides. Le système permet, à partir d'un même point d'observation, l'identification progressive, image par image, de phénomènes souvent difficiles à identifier avec certitude avec seulement un enregistrement continu ("streak").

Chaine de lecture de ruban magnétique fonctionnant avec le système de synchronisation pilot-tone

R. R. EPSTEIN et LEO M. O'DONNELL [972]

Les exigences de la production cinématographique, en ce qui concerne l'équipement léger synchrone de reportage, nécessitent l'emploi de caméras et d'enregistreuse fonctionnant sur batterie. Les fluctuations de vitesse des appareils employés lors du tournage sont enregistrées sous forme d'un signal de basse fréquence sur une piste-témoin gravée au milieu du ruban magnétique $^1/_4$" par une tête spéciale dont la fente est placée sur un axe perpendiculaire à celui de la tête d'enregistrement proprement dite. Lors de la reproduction, ces variations de vitesse sont corrigées par une synchroniseuse électronique conçue à l'origine pour un système d'onde porteuse à haute fréquence. On donne ici une description des modifications apportées à la synchroniseuse ainsi que les résultats obtenus. (*Tr. par R. R. Epstein*)

Collure due film téréphthalate de polyethylène à l'énergie ultra-sonore

F. P. ALLES [976]

Une étude systématique de six variables prouvées par des essais préliminaires d'être les plus importantes en collant la pellicule polyester "Cronar" au moyen de l'énergie ultra-sonore a démontré des interactions complexes. Pourtant, une bonne sphère d'application a été trouvée, donnant des collures utiles sans racler l'émulsion, les deux films se recouvrant de seulement 0,25 mm. Des collures aussi fortes que la pellicule elle-même ont été obtenues avec un recouvrement de 0,75 mm. La colleuse construite et utilisée dans ces études a pu accommoder des films de 8, 16, 35 et 70 mm et a donc permis des essais couvrant une grande diversité de conditions d'usage.

Revue de nouveaux tubes analyseurs de télévision

R. G. NEUHAUSER

Plusieurs nouveaux tubes analyseurs du type "image orthicon" et "vidicon" ont apparu sur le marché en 1960 et 1961. La performance de ces tubes est traitée en vue des applications diverses et des conditions d'exploitation. En ce qui concerne les "image orthicons" la tendance est de se diriger vers la spécialisation, afin de réaliser des tubes qui donnent des images blancs-et-noirs de qualité supérieure, et des caméras nouvelles, ou bien pour produire des images en couleurs avec des niveaux d'illumination prévus pour les studios "blancs-et-noirs." D'autres tubes ont été construits pour des télécapteurs à niveau lumineux très bas dans les applications caractérisées par des conditions d'éclairage extrêmement défavorables. La performance des nouveaux "vidicons" est caractérisée par l'augmentation de la sensibilité, et la valeur réduite du "gamma" est responsable des demi-teintes ameliorés et d'une plus grande sensibilité pour les niveaux de lumière basse. En plus, plusieurs types nouveaux furent créés pour des caméras spéciales, tant dans la domaine de l'émission que dans les emplois de télévision industriels. (*Tr. F. S. Veith*)

Informations pour les auteurs d'articles destinés à la SMPTE

BERNARD D. PLAKUN [983]

Il est donné des indications détaillées sur la marche à suivre par les auteurs dans la préparation d'un mémoire technique complet destiné à être publié et d'une version raccourcie appelée à être prèsentée verbalement. La forme à adopter est celle d'un article strictement technique. Bien que les directives fournies soient celles appliquées spécialement par la SMPTE, certaines des recommandations offertes sont d'ordre général et s'appliquent à tous genres d'articles techniques destinés à être publiés ou à être présentès verbalement.

Sistemas electrónicos y cinematográficos en la época espacial

BARTON KREUZER [961]

Durante los últimos cinco años tuvieron los intereses de nuestra Sociedad un cambio que excedió a toda predicción y que tuvo por causa los planes para explorar y utilizar el espacio exterior de la Tierra. Los ya establecidos campos de actividad de nuestra industria han proseguido según las tendencias predichas: la utilización de películas y de video-cinta magnetofónica ha aumentado en la teledifusión y en la televisión en circuito cerrado; los intereses audio-visuales se han desarrollado y ahora incluyen películas sonoras de 8 mm; y nuestras ocupaciones con sistemas fotográficos y electrónicos en labores de investigación, de ingeniería y de documentación también han aumentado. Nuestro papel en la época espacial ha sido desarrollar satélites y sistemas meteorológicos y de comunicaciones para exploraciones lunares y del espacio interplanetario, para lo cual hemos diseñado sistemas de TV y cinematográficos, los cuales habrán de producir un efecto profundo en la industria, particularmente en los ramos de educación y de fotografía ultrarrápida y por medio de miniaturización y robustecimiento.

La reunión de 1961 del ISO/TC 36, Cinematografía

DEANE R. WHITE [967]

Los representantes de los cuerpos de normalización nacional de diez países se reunieron en Garmisch-Partenkirchen, Alemania, para proseguir en su trabajo de ISO/TC 36, Cinematografía. La labor abarcó una amplia gama de materias que afectan, de varias maneras, el negocio internacional en el campo de la cinematografía. Cinco situaciones de actualidad, que se bosquejan, ilustran importantes aspectos del trabajo. Se autorizó que siete Grupos de Estudio continuaran sus trabajos en proyectos sin terminar. La continuación de estas actividades es importante para la industria de los Estados Unidos en este ramo.

Principio y ensayo del concepto de una cámera ultra-rápida que permite simultaneament el grabado continuo e imagen por imagen

L. R. TEEPLE, JR. [969]

Un principio simple que simultaneamente logra el grabado contínuo e imagen por imagen ("streak and framing record") de un mismo acontecimiento, permite la observación directa y distinta de una imagen durante el grabado contínuo de acontecimientos ultra-rápidos. El sistema permite, desde un mismo punto de observación, la identificación progresiva, imagen por imagen, de fenómenos frecuentemente difíciles de identificar con certeza con sólo un grabado contínuo ("streak").

Modificaciones en equipos de reproducción de banda magnética para el uso de los mismos con el sistema de sincronización por Frecuencia- Piloto

R. R. Epstein y Leo M. O'Donnell [972]

Las exigencias de la producción de películas en exteriores y la necesidad de poder disponer de equipo sincrónico de poco peso, demandan cámaras y grabadores magnéticos movidos por baterías. Las variaciones de velocidad del equipo de exteriores se graban como pista de control de baja frecuencia sobre el centro de la banda de $^1/_4$ de pulgada, perpendicularmente a la modulación del programa. Las grabaciones son reproducidas y corregidas en su velocidad mediante un sincronizador de reproducción, diseñado originalmente para un sistema portador de alta frecuencia de grabación sincrónica. Se describen las modificaciones introducidas en el sincronizador para el uso adicional mencionado y se dan datos de su rendimiento. (*Tr. Pablo Tabernero*)

Empalme ultrasonico de las peliculas de politereftalato etilenico

F. P. Alles [976]

Un estudio sistemático de seis variables, que en estudios preliminares probaron ser las más importantes para empalmar con energía ultrasónica la base poliestérica "Cronar", demostró interacciones complejas. Sin embargo, se encontró un buen nivel de trabajo con el que no hay que raspar la emulsión y con el que se obtiene un empalme de sólo 0,254 mm y se hacen empalmes tan fuertes como la base misma con un traslapo de 0,762 mm. El empalmador diseñado para estos estudios manipuló películas de 8, 16, 35 y 70 mm y, por lo tanto, permitió hacer pruebas en una extensa variedad de condiciones de uso.

Revista de los nuevos tubos para cámaras de televisión

R. G. Neuhauser [979]

En 1960 y 1961 se introducieron al mercado numerosos tubos tanto orticons como vidicons— para cámaras de televisión. Se discute el funcionamiento de estos tubos para sus difrentes y más propias aplicaciones, tanto como las condiciones en que estos tubos deben de operar. Los orticons se diseñaron especialmente para producir superiores imágenes en blanco y negro, considerando los recientes diseños de cámara, o bien para operar en color con niveles de luz igual que en blanco y negro. Otros tubos fueron construidos para trabajar en condiciones de luz extremadamente adversas. La accion de los nuevos vidicons refleja los recientes mejorámientos en sensibilidad con una gama más baja y mejor rendimiento de tonos siendo sensible a bajos niveles de luz. Además, se introducieron varios tubos para tareas especiales en los estudios o para usos industriales. (*Tr. Alex Quiroga*)

Información para autores de artículos de la SMPTE

Bernard D. Plakun [983]

Se describe en todos sus detalles sucesivos la tarea del autor en la preparación de un artículo técnico completo para su publicación y de una versión resumida para presentación oral. La forma es la de un verdadero escrito técnico. Aunque los procedimientos descritos son los utilizados específicamente por la SMPTE (Sociedad de Ingenierios en Cinematografía y Televisión), algunas de las sugerencias que se ofrecen son en general aplicables a todos los artículos técnicos destinados a su publicación o a presentación oral.

Elektronische und Film-Systeme im Zeitalter des Weltraumes

Barton Kreuzer [961]

In den vergangenen fünf Jahren haben sich die Interessen unserer Gesellschaft durch die Pläne zur Erforschung und Nutzung des Weltraumes über jede Erwartung hinaus verlagert. Unsere Industrien sind den vorausgesagten Wegen weiter gefolgt: Die Verwendung von Film- und Bildstreifen hat auf dem Gebiet des Fernseh-Funks und Fernseh-Drahtfunks zugenommen. Da Interesse am Bildtonwesen ist weiter gestiegen und hat zum 8-mm Tonfilm geführt. Die Verwendung der Photographie und Elektronik in Forschung, Konstruktion und auf dem Gebiet des Dokumentenwesens ist weiter angestiegen. Im Zeitalter der Weltraumfahrt haben wir Wetterbeobachtungs- und Nachrichtensatelliten entwickelt, die zur Mondforschung und Erschliessung des interplanetaren Raumes dienen. Für diese Satelliten haben wir Film- und Fernsehgerät gebaut. Dieses Gerät wird sich auf die Industrie besonders in der Ausbildung, bei der Höchstgeschwindigkeitsphotographie und bei der Konstruktion kleiner und widerstandsfähiger Einheiten auswirken.

Die ISO-Tagung TC 36 Kinematographie 1961

Deane R. White [967]

Vertreter von nationalen Normenausschüssen aus zehn Ländern versammelten sich in Garmisch-Partenkirchen, Deutschland, um die Arbeit der ISO/TC 36, Kinematographie, weiterzuführen. Die Arbeit erstreckte sich über eine grosse Anzahl von Fragen, welche internationale Angelegenheiten im Gebiet der Kinematographie in verschiedener Weise betreffen. Fünf gegenwärtige Situationen sind beschrieben und illustrieren wichtige Gesichtspunkte dieser Arbeit. Sieben Fachgruppen wurden bevollmächtigt die Arbeit an nicht abgeschlossenen Projekten weiterzuführen. Die Weiterführung dieser Arbeiten ist wichtig für die amerikanische Industrie auf diesem Gebiet.

Prinzip und Beweis eines Konzepts für eine Kamera für die gleichzeitige Aufnahme von Streifen und Reihenbildern hoher Geschwindigkeit

L. R. Teeple, Jr. [969]

Ein einfaches Prinzip für die gleichzeitige Aufnahme von Streifen und Reihenbildern des gleichen Vorganges macht es möglich die Reihenbilder während der Aufnahme der schnellen Vorgänge, getrennt und direkt zu beobachten. Das Gerät ermöglicht eine fortlaufende Identifizierung des Vorganges vom gleichen Standpunkt, eine Aufgabe, die bei Streifenaufnahmen allein oftmals schwierig ist.

Nachsteuergerät für die synchrone Wiedergabe von Pilotton Aufnahmen

R. R. Epstein und Leo M. O'Donnell [972]

Mit der Einführung von leicht tragbaren Transistor Magnetbandgeräten sind in der Filmindustrie synchrone Aussenaufnahmen mit reduziertem Kostenaufwand und grösserer Beweglichkeit möglich geworden. Bei dem Pilotton Verfahren wird eine von der Bildwechselfrequenz der Bildkamera abgeleitete Steuerfrequenz gleichzeitig mit der Tonmodulation auf dem Magnetband aufgenommen. Diese Aufnahmen werden mit dem hier beschriebenen Nachsteuergerät synchron abgespielt. Das Gerät wurde ursprünglich für das 14 KHz Träger Synchronisations-System entwickelt. Die Anpassung für die zusätzlichen Erfordernisse des Pilotton Verfahrens wird beschrieben und Messresultate werden gegeben. (*Üb. R. R. Epstein*)

Kleben von Polyäthylenterephthalatfilm mittels Ultraschall-Energie

F. P. Alles [976]

Eine systematische Untersuchung von sechs Variablen, welche in Vorversuchen für das Kleben von "Cronar" Polyester-Filmunterlage unter Anwendung von Ultraschall-Energie als die wichtigsten befunden wurden, zeigte komplexe Zusammenhänge. Es wurde aber ein Arbeitsgebiet gefunden, in welchem brauchbare Klebungen erhalten wurden mit nur 0,25 mm Ueberlappung und ohne die Emulsion zu entfernen. Bei einer Ueberlappung von 0,75 mm waren die Klebstellen so stark wie die Filmunterlage selbst. Eine Klebepresse wurde entworfen und in diesen Untersuchungen gebraucht, welche Filme von 8, 16, 35 und 70 mm Breite verarbeiten konnte und daher Untersuchungen über ein weites Gebiet von Arbeitsbedingungen erlaubte.

Neue Fernseh-Aufnahmeröhren in Perspektive

R. G. Neuhauser

In den Jahren 1960 und 1961 sind dem Markte mehrere neue Fernseh-Aufnahmeröhren der Serien Superorthikon und Vidikon zugeführt worden. Die vorliegende Arbeit bespricht die Leistungsfähigkeiten dieser Röhren entsprechend ihrer Eignung für verschiedene Zwecke und die zu beachtenden Operationsbedingungen. Die Superorthikon-Serie folgt der Tendenz der Spezialisierung mit der Entwicklung neuer Röhren für bessere Schwarz-Weiss-Wiedergabe, den Entwürfen neuer Kameras, sowie der Entwicklung von Röhren für Farbaufnahmen unter normalen Scwarz-Weiss-Studiobeleuchtungsverhältnissen. Ausserdem wurden Röhren entwickelt die Szenenaufnahmen unter sehr schwierigen Beleuchtungsbedingungen ermöglichen. Die Leistungen der neuen Vidikon-Röhren ziegen die letzlichen Verbesserungen in Empfindlichkeit; ihre niedrigere Gamma-Kennlinie verbessert die Farbtonwiedergabe und die Empfindlichkeit für schwache Lichtwerte. Ausserdem wurden verschiedene neue Röhrentype entwickelt, die besonderen Aufnahmezwecken für Fernsehsender und Industrieanlagen dienen. (*Üb. H. Popp*)

Mitteilung für die Verfasser von SMPTE-Schriften

Bernard D. Plakun [983]

Des Verfassers Arbeit bezüglich Präparierung einer vollständigen technischen Schrift bis zu deren Druckreife, sowie die gekürzte Abfassung für eine persönliche Ansprache vor einer Audienz, wird hier Stufe bei Stufe beschrieben. Die gg. Form ist die einer aktuellen technischen Schrift. Obwohl sich die erörterte Prozedur spezifisch auf das Blatt der Film u. Fernseh-Ingenieure (SMPTE) bezieht, der generelle Sinn der gebotenen Ausführungen kann jedoch auch dann angewandt werden, wenn der Autor entweder eine gedruckte Schrift zwecks Publizierung anderswo im Sinne hat-oder, wie schon bemerkt, eine gekürzte Abfassung zwecks persönlicher Diskutierung in Angriff nehmen möchte. (*Üb. Lucas G. Lawrence*)

Ed. Note: Titles and abstracts of all papers published in the *Journal* are published in French, Spanish and German. This department (Résumés/Resumenes/Zusammenfassungen) was set up in recognition of the growth in the Society's overseas membership, and first appeared as a regular feature of the *Journal* in the January 1961 issue. Comments and suggestions are invited on the quality and possible improvement of the translations. Because of the prohibitive cost of commercial translations, volunteer help is needed, and such assistance will represent an important contribution to the Society. Contributors will, of course, be given full acknowledgment in the *Journal*.

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News Columns

Advertisers

Meeting Calendar

ASME, Symposium on Thermophysical Properties, Jan. 22–26, 1962, Princeton Univ., Princeton, N. J.

American Physical Society, Jan. 24–27, 1962, New York.

AIEE, Winter General Meeting, Jan. 28–Feb. 2, 1962, Hotel Statler, New York.

Institute of the Aerospace Sciences, Annual National Meeting, Jan. 29–31, 1962, Hotel Astor, New York.

Society of the Plastics Engineers, Annual Technical Conference, Jan. 30–Feb. 2, 1962, Penn-Sheraton Hotel, Pittsburgh, Pa.

AICE, National Meeting Feb. 4–7, 1962, Statler-Hilton, Los Angeles.

American Society for Quality Control, Middle Atlantic Conference, Mar. 8, 9, Statler-Hilton Hotel, Washington, D. C.

American Society of Photogrammetry, Annual Convention, Mar. 11–17, 1962, Washington, D. C.

Audio Engineering Society, Annual Spring Convention, Mar. 19–26, Ambassador Hotel, Los Angeles.

American Chemical Society, National Meeting, Mar. 20–29, 1962, Washington, D. C.

IRE International Convention, Mar. 26–29, 1962, New York.

Polytechnic Institute of Brooklyn, 12th International Symposium on the Mathematical Theory of Automata, Apr. 24–26, 1962, United Engineering Center Auditorium, New York.

91st Semiannual Convention of the SMPTE and Equipment Exhibit, Apr. 29–May 4, 1962, Ambasador Hotel, Los Angeles.

Second International Television Symposium, Apr. 30–May 4, Montreux Switzerland.

IRE, International Congress on Human Factors in Electronics, May 3, 4, Lafayette Hotel, Long Beach, Calif.

Electrochemical Society, Annual Meeting, May 6–10, 1962. Statler-Hilton Hotel, Los Angeles.

SPSE Annual Conference, May 7–11, 1962, Somerset Hotel, Boston, Mass.

Illuminating Engineering Society, Midwest/North Central Regional Meeting, May 10, 11, Radisson Hotel, Minneapolis, Minn.

Illuminating Engineering Society, Canadian Regional Meeting, May 14, 15, Winnipeg, Canada

IRE, National Aerospace Electronics Conference, May 14–16, 1962, Dayton, Ohio.

AICE, National Meeting, May 20–23, Lord Baltimore Hotel, Baltimore, Md.

American Society for Quality Control, Annual Convention and Exhibit, May 23–25, Netherland-Hilton Hotel, Cincinnati, Ohio.

AIEE, ARS, IRE, ISA, National Telemetering Conference, May 23–25, 1962, Sheraton-Park Hotel, Washington, D. C.

Armed Forces Communications and Electronics Association, Annual Convention and Show, June 12–14, Sheraton Park and Shoreham Hotels, Washington, D. C.

AIEE, Summer General Meeting, June 17–22, Denver-Hilton Hotel, Denver, Colo.

6th International Congress on High-Speed Photography, Sept. 17–22, 1962, Hotel Kurhaus, Scheveningen, Netherlands.

National Electronics Conference, Oct. 8–10, McCormick Place, Chicago.

92nd Semiannual Convention of the SMPTE and Equipment Exhibit, Oct. 21–26, 1962, Drake Hotel, Chicago.

93rd Semiannual Convention of the SMPTE and Equipment Exhibit, Apr. 21–26, 1963, Traymore Hotel, Atlantic City, N. J.

94th Semiannual Convention of the SMPTE and Equipment Exhibit, Oct. 15–18, 1963, Somerset Hotel, Boston.

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SMPTE Officers and Committees: The rosters of the Officers of the Society, its Sections, Subsections and Chapters and of the Committee Chairmen and Members were published in the April 1961 Journal.

sustaining members

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- Advance in the theory and practice of engineering in motion pictures, television and the allied arts and sciences;
- Standardization of equipment and practices employed therein;
- Maintenance of high professional standing among its members;
- Guidance of students and the attainment of high standards of education;
- Dissemination of scientific knowledge by publication.

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PART 2 WAS PHOTOGRAPHED

BEGINNING OF THIS VOLUME.

THE VOLUME INDEX.

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